

## Installation Guide

# hp StorageWorks SAN Director 2/128

**Product Version:** 4.2.x

Second Edition (April 2004)

**Part Number:** AA-RVUSB-TE

This installation guide provides procedures for setting up, configuring, and managing the Enterprise class SAN Director 2/128 switch.



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SAN Director 2/128 Installation Guide  
Second Edition (April 2004)  
Part Number: AA-RVUSB-TE

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## about this guide

This installation guide provides information to help you:

- Review SAN Director 2/128 hardware components
- Set up and configure the SAN Director 2/128
- Operate and manage the SAN Director 2/128
- Install SAN Director 2/128 Field Replaceable Units (FRUs)
- Set up and install modems

“About this Guide” topics include:

- [Overview](#), page 10
- [Conventions](#), page 11
- [Getting Help](#), page 14

## Overview

This section covers the following topics:

- [Intended Audience](#)
- [Related Documentation](#)

## Intended Audience

This book is intended for use by system administrators and technicians who are experienced with the following:

- HP StorageWorks Fibre Channel SAN switches
- Fabric Operating System version 4.2.x or later

## Related Documentation

Documentation, including white papers and best practices documents, is available via the HP website. Please go to:

<http://www.hp.com/country/us/eng/prodserv/storage.html>

To access v4.2.x related documents:

1. Locate the "Networked storage" section of the web page.
2. Under "Networked storage," go to the "By type" subsection.
3. Click **SAN infrastructure**. The SAN infrastructure page displays.
4. Locate the Fibre Channel Switches section.
5. Locate the B-Series Fabric subsection, then go to the "Enterprise Class" subsection.
6. To access version 4.2.x documents (like this document), select **SAN Director 2/128** or **SAN Director 2/128 power pack**. The switch overview page displays.
7. Go to the "product information section," located on the far right side of the web page.
8. Click **technical documents**.
9. Follow the onscreen instructions to download the applicable documents.

## Conventions

Conventions consist of the following:

- [Document Conventions](#)
- [Text Symbols](#)
- [Equipment Symbols](#)

## Document Conventions

This document follows the conventions in [Table 1](#).

**Table 1: Document Conventions**

Convention	Element
Blue text: <a href="#">Figure 1</a>	Cross-reference links
<b>Bold</b>	Menu items, buttons, and key, tab, and box names
<i>Italics</i>	Text emphasis and document titles in body text
Monospace font	User input, commands, code, file and directory names, and system responses (output and messages)
<i>Monospace, italic font</i>	Command-line and code variables
Blue underlined sans serif font text ( <a href="http://www.hp.com">http://www.hp.com</a> )	Web site addresses

## Text Symbols

The following symbols may be found in the text of this guide. They have the following meanings:



**WARNING:** Text set off in this manner indicates that failure to follow directions in the warning could result in bodily harm or death.



**Caution:** Text set off in this manner indicates that failure to follow directions could result in damage to equipment or data.

---

**Tip:** Text in a tip provides additional help to readers by providing nonessential or optional techniques, procedures, or shortcuts.

---

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**Note:** Text set off in this manner presents commentary, sidelights, or interesting points of information.

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## Equipment Symbols

The following equipment symbols may be found on hardware for which this guide pertains. They have the following meanings:



Any enclosed surface or area of the equipment marked with these symbols indicates the presence of electrical shock hazards. Enclosed area contains no operator serviceable parts.

**WARNING:** To reduce the risk of personal injury from electrical shock hazards, do not open this enclosure.

---



Any RJ-45 receptacle marked with these symbols indicates a network interface connection.

**WARNING:** To reduce the risk of electrical shock, fire, or damage to the equipment, do not plug telephone or telecommunications connectors into this receptacle.

---



Any surface or area of the equipment marked with these symbols indicates the presence of a hot surface or hot component. Contact with this surface could result in injury.

**WARNING:** To reduce the risk of personal injury from a hot component, allow the surface to cool before touching.

---





Power supplies or systems marked with these symbols indicate the presence of multiple sources of power.

**WARNING:** To reduce the risk of personal injury from electrical shock, remove all power cords to completely disconnect power from the power supplies and systems.

---



Any product or assembly marked with these symbols indicates that the component exceeds the recommended weight for one individual to handle safely.

**WARNING:** To reduce the risk of personal injury or damage to the equipment, observe local occupational health and safety requirements and guidelines for manually handling material.

---

## Getting Help

If you still have a question after reading this guide, contact an HP authorized service provider or access our web site at <http://www.hp.com>.

## HP Technical Support

Telephone numbers for worldwide technical support are listed on the following HP web site: <http://www.hp.com/support/>. From this web site, select the country of origin.

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**Note:** For continuous quality improvement, calls may be recorded or monitored.

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Be sure to have the following information available before calling:

- Technical support registration number (if applicable)
- Product serial numbers
- Product model names and numbers
- Applicable error messages
- Operating system type and revision level
- Detailed, specific questions

## HP Storage Web Site

The HP web site has the latest information on this product, as well as the latest drivers. Access storage at: <http://www.hp.com/country/us/eng/prodserv/storage.html>. From this web site, select the appropriate product or solution.

## HP Authorized Reseller

For the name of your nearest HP authorized reseller:

- In the United States, call 1-800-345-1518
- In Canada, call 1-800-263-5868
- Elsewhere, see the HP web site for locations and telephone numbers:  
<http://www.hp.com>.

# Overview



This chapter provides the following information:

- [Key Features](#), page 16
- [Hardware Components](#), page 17
- [High Availability](#), page 20
- [Reliability](#), page 21
- [Serviceability](#), page 22
- [Management Summary](#), page 24
- [Optional Hardware Kits](#), page 27

## Key Features

The HP StorageWorks SAN Director 2/128 represents the next generation of advanced Fibre Channel Director models used to interconnect storage devices, hosts, and servers intelligently in a Storage Area Network (SAN). The 128-port Fibre Channel Director delivers performance, scalability, flexibility, functionality, reliability, and availability.

Key features of the SAN Director 2/128 include the following:

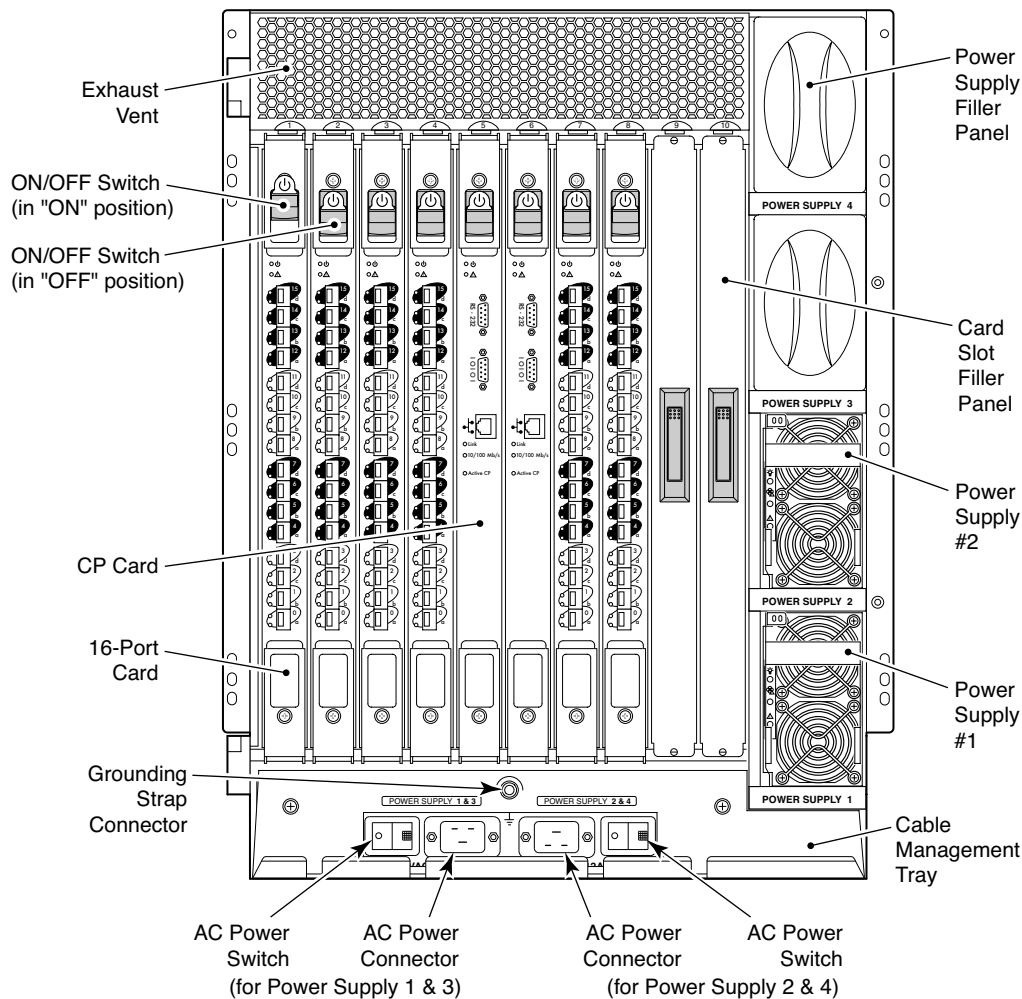
- 128 ports in a single chassis, providing a high-density, scalable, rack-ready solution for SAN backbones.
- High-availability platform for mission-critical SAN-designed applications.
- Dual, redundant Control Processors (CP) provide high availability and enable nondisruptive software upgrades.
- Nonblocking architecture enables all 128 ports to operate at full 2 Gb speed simultaneously.
- Universal ports self-configure as E-ports, F-ports, or FL-ports.
- Small form-factor pluggable (SFP) optical transceivers support any combination of short wavelength (SWL), long wavelength (LWL), and extended long wavelength (ELWL) optical media on a single switch module (the 16-port card).
- Forward and backward compatibility with HP StorageWorks switches.
- High availability redundant design, extensive diagnostics, and system monitoring capabilities integrated with Fabric OS management tools deliver unprecedented reliability, availability, and serviceability (RAS).
- Support for 1 and 2 Gb/sec autosensing Fibre Channel ports (trunking technology groups up to four ports together to create high-performance 8 Gb/sec ISL trunks between switches).

## Hardware Components

The SAN Director 2/128 features a modular and scalable mechanical construction that allows a wide range of flexibility in switch installation, fabric design, and maintenance. HP supports two SAN Director 2/128 switches in an HP 10,000 series, HP System/e or comparable EIA cabinet.

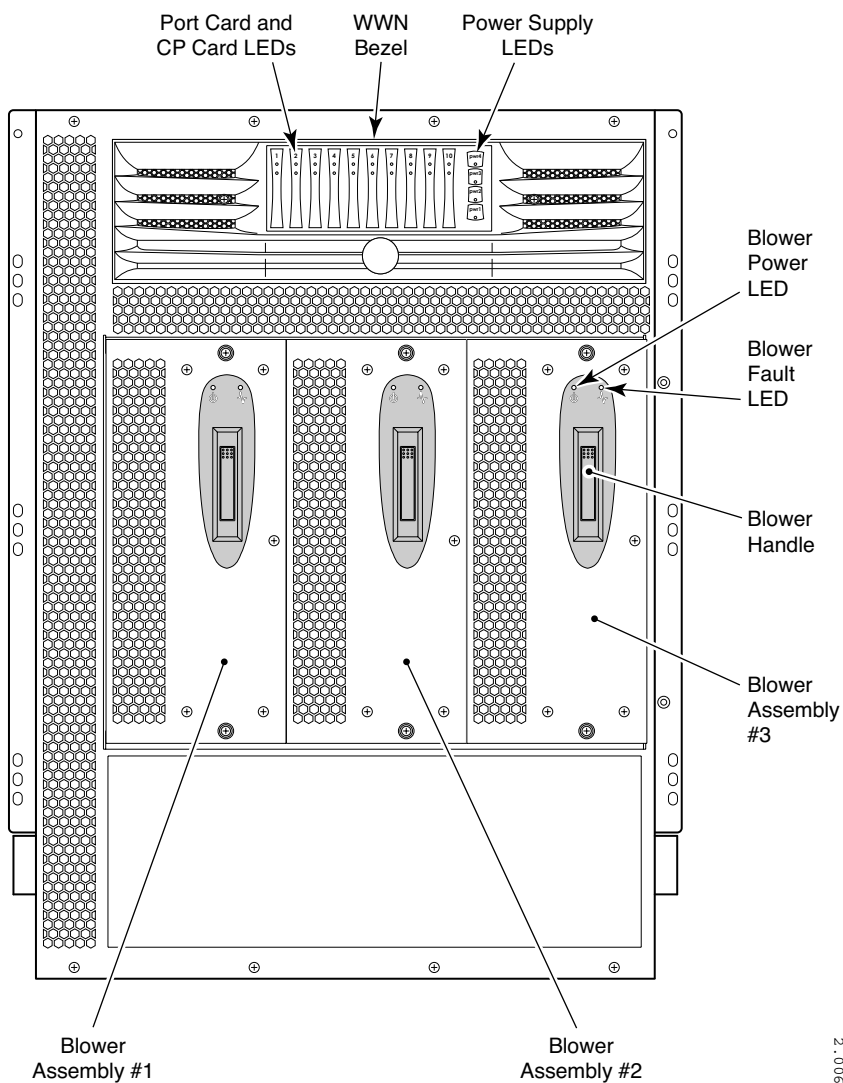
The modular chassis consists of the following:

- Up to eight hot-swappable 16-port cards, delivering up to 128 Fibre Channel ports in a single chassis
- Two slots for control processor (CP) cards (slots 5 and 6):
  - A single active CP card can control all 128 ports in the chassis
  - The standby CP card assumes control of the switch if the active CP fails
- Modular hot-swappable field replaceable units (FRUs):
  - 16-port cards (1-8)
  - CP cards (2)
  - Small form-factor pluggable (SFP) optical transceivers
  - Blower assemblies (3)
  - Power supplies (2)
- Cables, cards (16-port and CP), and power supplies serviced from the port side of the SAN Director 2/128 and blowers serviced from the nonport side
- Support for mounting the chassis with the port side facing the air-intake aisle if adequate cooling is provided
- Easy cable management using a cable management tray and cable guides (pillars)
- Three blowers provide cooling, allowing continuous operation even if one blower fails
- Constant intake and FRU temperature monitoring
- World Wide Name (WWN) card on the nonport side, to maintain chassis-specific information such as WWNs, IP addresses, and summary status information of each card (16-port and CP) and power supply through LEDs



**Figure 1: SAN Director 2/128 (port side)**

**Note:** Card slots are numbered 1 through 10 (left to right). Slots 1–4 and 7–10 accommodate the 16-port cards, and slots 5–6 accommodate the CP cards.



**Figure 2: SAN Director 2/128 (non-port side)**

## High Availability

The following features contribute to the SAN Director 2/128 high-availability design:

- Redundant, hot-swappable components
- Redundant power and cooling subsystems
- Enhanced data integrity on all data paths
- Fabric Shortest Path First (FSPF) rerouting around failed links
- Integration with SNMP managers
- Automatic control processor fail over
- Nondisruptive “hot” software code loads and activation
- Easy configuration, save, and restore

The high-availability software architecture of the SAN Director 2/128 provides a common framework for all applications that reside on the system, allowing global and local states to be maintained enough to manage any component failure.

High-availability elements consist of the High Availability Manager, the heartbeat, the fault/health framework, the replicated database, initialization, and software upgrade.

The High Availability Manager controls access to the standby control processor, facilitates software upgrades, prevents extraneous switchover activity, closes and flushes streams as needed, provides flow control and message buffering, and supports a centralized active and standby state.



## Reliability

The SAN Director 2/128 uses the following error detection and correction mechanisms to ensure the reliability of all data inside the chassis:

- Power-on self test (POST)
- Error Detection and Fault Isolation (EDFI), such as cyclic redundancy checking (CRC), parity checking, checksum, and illegal address checking
- Dual control processors that enable hot, nondisruptive fast firmware upgrades  
Each control processor contains two serial ports and one Ethernet port. Offline control processor diagnostics and remote diagnostics simplify troubleshooting. The standby control processor continuously runs diagnostics to ensure it is operational, should a failover be necessary.
- I<sup>2</sup>C monitoring and control, used between Integrated Circuits (IC) to monitor how they are working.

## Serviceability

The SAN Director 2/128 provides the following features to enhance and ensure serviceability:

- Modular design with hot-swappable components
- Redundant flash memory that stores two firmware images per control processor
- Extensive diagnostics and status reporting, along with a serial port to support an external, country-specific modem for remote diagnostics and status monitoring
- Nonvolatile random-access memory (NVRAM), containing the HP serial number, Manufacturer's serial number, revision information, and part number information
- Background health-check daemon
- Memory scrubber, self test, and bus ping to determine if a bus is not functioning
- Watchdog timers
- Status LEDs
- Predictive diagnostics analysis through Fabric Watch
- SNMP integration with higher-layer managers

## Optional Management Features

Refer to the *HP StorageWorks SAN Director 2/128 Version 4.2.x Release Notes* for a complete list of management and optional software features enabled on the switch.

## Interoperability

Fabric OS v4.2.x interoperates with HP StorageWorks switches running Fabric OS version 2.6 or higher.

## Security

Secure telnet access is available using Secure Shell (SSH), a network security protocol for secure remote login and other secure network services over an insecure network.

Web Tools management is available via a secure browser using Secure Sockets Layer (SSL). The SSL security protocol provides data encryption, server authentication, message integrity, and optional client authentication for a TCP/IP connection. Because SSL is built into all major browsers and Web servers, installing a digital certificate turns on the SSL capabilities.

## Network Manageability

The SAN Director 2/128 is managed as a single element and appears as a single element to a Network Management System (NMS). The director responds to its own IP address and appears as a separate entity to the Telnet protocol and SNMP.

The management interfaces include blade assemblies as intermediate components between switches and ports. In addition, all management interfaces, such as telnet, Web Tools, the Fabric Access Layer API, and Management Server, support a “port N within blade M” naming scheme.

When SNMP devices send SNMP messages to a management console running SAN management software, the information is stored in a management information base (MIB). Fabric OS v4.2.x supports the latest Fibre Alliance Fibre Channel Management (FCMGMT) and Storage Management Initiative (SMI) MIBs, which allow common information necessary for management software to provide information to a SAN administrator.

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**Note:** Refer to the *HP StorageWorks MIB 4.2.x Reference Guide* for additional MIB information.

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## Management Summary

The SAN Director 2/128 can be managed in-band using Fibre Channel protocol, or out-of-band by connecting to the Ethernet port. The management functions allow the administrator to monitor fabric topology, port status, physical status, and performance statistics.

The SAN Director 2/128 is compatible with the following management interfaces:

- Command Line Interface (CLI) through a telnet connection
- Advanced Web Tools, an integrated GUI
- SNMP applications

## Managing the SAN Director 2/128

You can use the management functions built into the SAN Director 2/128 to monitor the fabric topology, port status, physical status, and other information to aid in performance analysis and system debugging.

You can manage the SAN Director 2/128 using any of the management options listed in [Table 2](#). For information about inband support, contact the switch provider.

The SAN Director 2/128 includes the Fabric OS and is compatible with HP StorageWorks 1 Gb and 2 Gb SAN switches.

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**Note:** For information about upgrading the Fabric OS, refer to the *HP StorageWorks Fabric OS 4.2.x Procedures User Guide*.

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Table 2 lists the SAN Director 2/128 management tools.

**Table 2: Management Options for SAN Director 2/128**

Management Tool	Out-of-band Support
Command line interface For ethernet, up to two admin sessions and four user sessions at same time. For details, refer to the <i>HP StorageWorks Fabric OS 4.2.x Procedures User Guide</i> and the <i>HP StorageWorks Fabric OS 4.2.x Command Reference Guide</i> . Sectelnet and Secure Shell clients are both supported.	Ethernet or serial connection
Fabric Manager Fabric Manager v4.1.1 or later required. For information refer to the <i>HP StorageWorks Fabric Manager 4.1.1 User Guide</i> .	Ethernet
Web Tools For information refer to the <i>HP StorageWorks Advanced Web Tools 4.2.x User Guide</i> .	Ethernet
Standard SNMP applications For information refer to the <i>HP StorageWorks MIB 4.2.x Reference Guide</i> .	Ethernet
Management server For information about MS, refer to the <i>HP StorageWorks Fabric OS 4.2.x Procedures User Guide</i> and the <i>HP StorageWorks Fabric OS 4.2.x Reference Guide</i> .	Ethernet

**Note:** To ensure efficiency and interoperability, HP recommends upgrading switches to the latest firmware version. Go to <http://www.hp.com> to obtain the latest firmware.

## Supported Features

The SAN Director 2/128 supports the following software features. Refer to the *HP StorageWorks SAN Director 2/128 Version 4.2.x Release Notes* to determine which features require purchasing a license key for activation.

- Zoning
- Secure Fabric OS
- ISL Trunking
- Fabric Watch
- Performance Monitoring
- Extended Fabric
- Remote Switch

## Optional Hardware Kits

Table 3 lists SAN Director 2/128 optional hardware kits.

**Table 3: SAN Director 2/128 Orderable Hardware**

Accessory	Part Number
Short wavelength SFP	A6515A* or 300834-B21**
Long wavelength SFP, 10 km	A6516A* or 300835-B21**
Long wavelength SFP, 35 km	300386-B21**
2m LC-to-LC Fibre Channel (fc) cable	C7524A*
2m LC-to-LC multi-mode fc cable	221692-B21**
16m LC-to-LC fc cable	C7525A*
5m LC-to-LC multi-mode fc cable	221692-B22**
50m LC-to-LC fc cable	C7526A*
15m LC-to-LC multi-mode fc cable	221692-B23**
200m LC-to-LC fc cable	C7527A*
30m LC-to-LC multi-mode fc cable	221692-B26**
50m LC-to-LC multi-mode fc cable	221692-B27**
2m LC-to-SC fc cable	C7529A*
2m LC-to-SC multi-mode fc cable	221691-B21**
16m LC-to-SC fc cable	C7530A*
5m LC-to-SC multi-mode fc cable	221691-B21**
15m LC-to-SC multi-mode fc cable	221691-B23**
30m LC-to-SC multi-mode fc cable	221691-B26**
50m LC-to-SC multi-mode fc cable	221691-B27**
SC female to SC female adapter	C7534A*
2m LC male to SC male adapter kit	C7534A*

\* premerger HP part number

\*\* premerger Compaq part number





# Installing and Configuring the SAN Director 2/128

## 2

This chapter provides the following information:

- [Time and Items Required](#), page 30
- [Installation and Safety Considerations](#), page 32
- [Unpack and Verify Carton Contents](#), page 34
- [Site Planning and Safety Guidelines](#), page 36
- [Installation Overview](#), page 38
- [Powering on the SAN Director 2/128](#), page 57
- [Establishing a Serial Connection](#), page 61
- [Managing Cables](#), page 63
- [Initial Configuration Parameters](#), page 67
- [Configure IP Addresses for CP Cards](#), page 69
- [Configure IP Address for the Switch](#), page 71
- [Establish an Ethernet Connection](#), page 72
- [Customize a Switch Name](#), page 73
- [Specify Status Policies](#), page 74
- [Set the Domain ID](#), page 75
- [Connect to the Fabric and Configure Fabric Parameters](#), page 76
- [Enable Software Licenses](#), page 78
- [Back Up the Configuration](#), page 79

## Time and Items Required

Table 4 describes the main installation and setup tasks and the estimated time required for each task based on a fully populated SAN Director 2/128 switch (128 Fibre Channel ports). Configurations containing fewer than 128 ports require less time. These time estimates assume a prepared installation site and appropriate power and network connectivity.

**Table 4: SAN Director 2/128 Installation Tasks, Estimated Time, and Items Required**

Installation Task	Time Estimate	Items Required
Unpacking switch	30 minutes	1/2-inch socket wrench (to remove pallet bolts) #2 Phillips screwdriver (for cable management tray) Pallet jack Hydraulic lift or assisted lift, able to raise to a minimum of 55 inches (140 cm), with a minimum capacity of 212 lbs (96 kg).
Installing switch in the 14U Rack Mount Kit supplied with the switch	45 minutes	<i>HP StorageWorks SAN Director 2/128 Installation Guide</i> , part number AA-RVUSA-TE (this guide)
Installing power cables and serial cable and configuring IP addresses	20 minutes	Power cables and serial cable (provided in SAN Director 2/128 accessory kit) Workstation computer with a serial port or terminal server port and a terminal emulator application (such as HyperTerminal) Ethernet IP addresses for the switch (1) and for each CP card (2): total three addresses

**Table 4: SAN Director 2/128 Installation Tasks, Estimated Time, and Items Required (Continued)**

Installation Task	Time Estimate	Items Required
Installing Ethernet cable(s) and configuring the switch name, policies, domain ID, PIDs, or additional system parameters	20 minutes	Ethernet cabling (optional) for telnet access  All other configuration parameters optional  Refer to the <i>HP StorageWorks Fabric OS 4.2.x Procedures User Guide</i> for PID information
Installing SFP optical transceivers	30 minutes	SFP optical transceivers
Attaching fiber optic cables and cable guides	60 minutes	Fiber optic cables and cable guides

## Installation and Safety Considerations



**WARNING:** For safety reasons, when installing this product in an equipment rack, you must consider rack stability against tipping. Please refer to the user manual provided with the equipment rack to determine rack stability (available through the HP Web site at:

<http://www.hp.com/racksolutions/prodinfo/racks/index.html>).

If the necessary stability is not achieved through the placement of additional equipment or ballast, the equipment rack must be anchored to the building structure before operation.



**WARNING:** A fully populated HP StorageWorks SAN Director 2/128 weighs approximately 250 pounds (113 kg) and requires a minimum of two people and a mechanical lift to install it.

Before installing, verify that the additional weight of the chassis does not exceed the cabinet's weight limits or unbalance the cabinet, including when some of the cards or power supplies are partially extended out of the chassis.



**Caution:** To ensure adequate cooling, install the chassis with the port side facing the aisle into which exhaust air is released (usually called the service aisle). This prevents the fans from pulling in heated exhaust air.

You must complete the following steps to ensure correct installation and operation:

- Provide a space that is 14U high, 29 inches deep, and 19 inches wide (1U = 1.75 inches). Also provide an additional 1U for cable management.
- If installing in a cabinet:
  - Ensure the space in the 19 inch (48.3 cm) EIA cabinet is 14U high, with a minimum distance of 28.25 inches (71.76 cm) between the front and back rails, and a maximum distance of 29.88 inches (75.90 cm).
  - Verify that the additional weight of the chassis does not exceed the cabinet's weight limits.
  - Ensure that all equipment installed in the cabinet is grounded through a reliable branch circuit connection. Do not rely on a secondary connection to a branch circuit, such as a power strip.

- Ensure that two dedicated electrical branch circuits with the following characteristics are available for use:
  - 200 to 240 VAC, 50—60 Hertz.
  - Protected by a circuit breaker in accordance with local electrical codes.
  - Supply circuit, line fusing, and wire size that are adequate according to the electrical rating on the chassis nameplate.
  - Grounded outlets installed by a licensed electrician and compatible with the power cords.
  - Located close to the 14U HP StorageWorks SAN Director 2/128 chassis and easily accessible.

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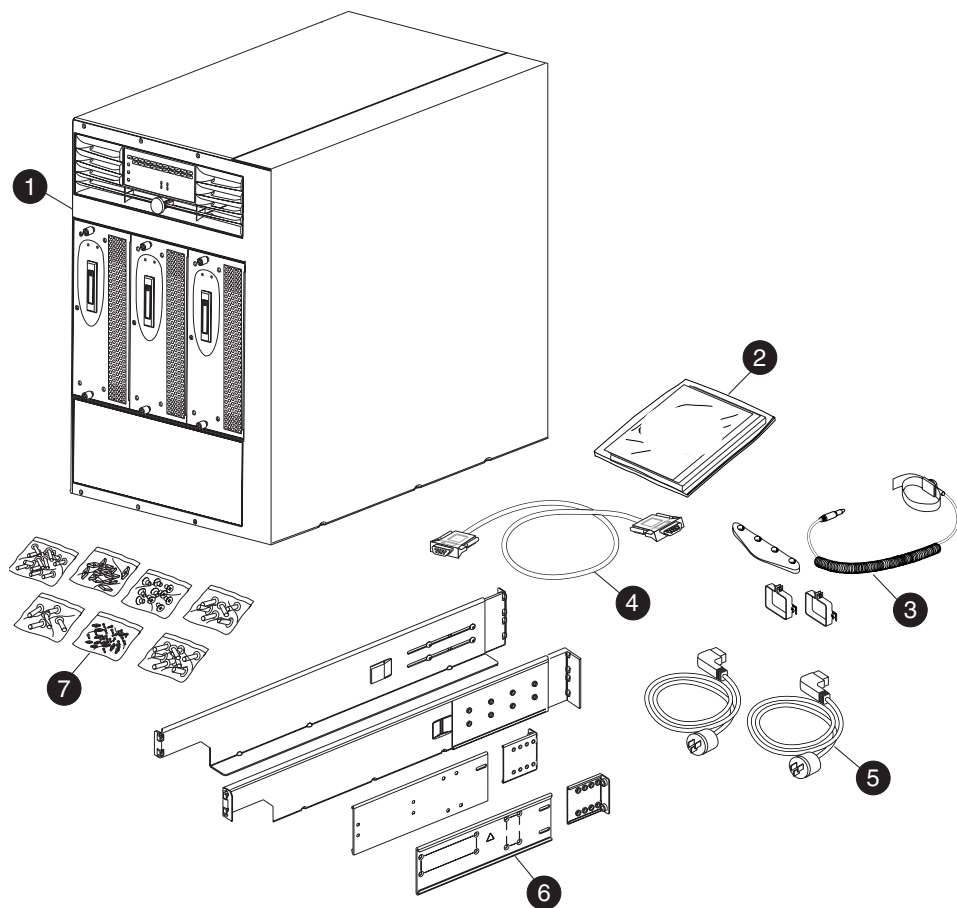
**Note:** To maximize fault tolerance, connect each power cord to a separate power source.

---

- Ensure the HP StorageWorks SAN Director 2/128 has access to a minimum airflow of 350 cubic feet per minute.
- Ensure the air temperature measured at the blower inlet does not exceed 40 degrees Celsius during operation.

## Unpack and Verify Carton Contents

Unpack and verify SAN Director 2/128 shipping carton contents. See [Figure 3](#) and [Table 5](#).



**Figure 3: SAN Director 2/128 carton contents**

**Note:** SFP transceivers can be ordered separately from your authorized HP representative. The SAN Director 2/128 supports SWL, LWL, and ELWL transceivers. See [SAN Director 2/128 Orderable Hardware](#), page 27.

**Table 5: SAN Director 2/128 Carton Contents Checklist**

Item	Summary
①	SAN Director 2/128 base configuration consists of two CP cards, two 16-port cards, one WWN card, two power supplies, three blower assemblies, one cable management tray, and sixteen cable management guides.
②	One set of <i>HP StorageWorks SAN Director 2/128 4.2.x</i> product documentation including Read Me First document, Installation Guide, Safety Guides, HP Polish Regulation Document, User License and Warranty and license.
③	An Accessory Kit containing one ESD grounding strap, sixteen cable guides (also known as pillars) and a cable retainer kit (consisting of two power cord retainers).
④	RS-232 serial cable with an RJ-45 adapter. Please note that you will need to attach the RJ-45 adapter to the end of the serial cable. The serial cable depicted in Item 4 shows the RJ-45 adapter already attached.
⑤	<p>AC power cords (2), appropriate to country where switch is installed.</p> <p>In addition, there are (2) PDU power cords and (2) pigtail power cords (not shown).</p> <p>HP recommends connecting two optional Power Distribution Units (PDUs) to the switch for power redundancy. The HP PDU model recommended is E7671A. The recommended power cords to connect from the PDU to the wall are E7803A, E7805A, E7806A, E7808A, E7809A. Both are standard US receptacles. These cables are then plugged into a PDU in the rack, which is customized by country.</p>
⑥	<p>14U Rack Mount Kit Rails:</p> <ul style="list-style-type: none"> <li>• Left rack mount shelf bracket, (1); Right rack mount shelf bracket (1)</li> <li>• Left upper rack mount bracket assembly, includes: Left upper rack mount bracket (flat); Left upper rack mount bracket (L-shaped); Screw (torque to 32 inch-pounds)</li> <li>• Right upper rack mount bracket assembly, includes: Right upper rack mount bracket (flat); Right upper rack mount bracket (L-shaped); Screw (torque to 32 inch-pounds)</li> </ul>
⑦	<p>14U Rack Mount Kit hardware:</p> <ul style="list-style-type: none"> <li>• #10-32 x 5/16 Phillips flathead screws (8); #10-32 x 5/16 Phillips panhead screws with washers (4)</li> <li>• For use with an HP 42U rack (or racks with square holes): #10-32 x 5/16 retainer nuts; #1/4-20 x 0.500 Phillips panhead screws with glue (16); 0.375-inch square washers (16)</li> <li>• For use with rack with round holes: #10-32 clip nut (package of 20, only 4 required); #1/4-20 x 1/2 inch Phillips panhead screws, with lockhead washers (16)</li> </ul>

## Site Planning and Safety Guidelines



**WARNING:** A fully populated SAN Director 2/128 (two power supplies) weighs approximately 250 lbs (113 kg) and requires a minimum of two people and a hydraulic or assisted lift to install it.

Do not use the any of the bays (such as the power supply or blower assembly bays) for leverage.

To ensure adequate cooling, install the chassis with the nonport side facing the air-intake aisle. This prevents the fans from pulling in heated exhaust air.

---

The following steps are required to ensure correct installation and operation:

1. Locate an area that is 14 rack units (14U) high, 29-inches deep, and 19-inches wide. (1U = 1.75 inches)
2. Position the SAN Director 2/128 with the nonport side facing the air-intake (cool) aisle.

---

**Note:** The SAN Director 2/128 can be installed facing either direction, if serviceability and cooling needs are met.

---

3. Plan for cable management before installing the chassis (see “[Managing Cables](#)” on page 63).

Cables can be managed in a variety of ways, such as by routing cables below the chassis, to either side of the chassis, through cable channels on the sides of the cabinet, or by using patch panels. If the cables will be routed below the chassis, leave a minimum of 3U of space below the chassis.

---

**Note:** Placing the switch on the floor is not recommended because this would prevent using the cable management tray and would make cable routing difficult.

---



4. Verify that two dedicated electrical branch circuits are available, as follows:
  - 200 to 240 VAC, 50 to 60 Hz
  - Circuit breaker protection in accordance with local electrical codes
  - Supply circuit, line fusing, and wire size adequate to the electrical rating on the chassis nameplate
  - Easily accessible to the SAN Director 2/128 chassis
  - Grounded outlets installed by a licensed electrician, compatible with the power cords

---

**Note:** To maximize fault tolerance, connect each power cord to a separate power source.

---

5. Ensure that the switch fans have access to a total minimum air flow of 350 cubic feet per minute (595 cubic meters per hour).
6. Ensure that the air intake and exhaust vents have a minimum of two inches of airspace.
7. Ensure that the air temperature on the air intake side is less than 40° Celsius (104° Fahrenheit) during operation.

## Installation Overview

Install the SAN Director 2/128 in one of the following ways

- As a standalone unit on a stable table or lab workbench
- In a rack using the 14U Rack Mount Kit supplied with the switch

## Selecting an Operating Location

Verify that the switch location meets the following requirements:

- Supply circuit, line fusing, and wire size that are adequate according to the electrical rating on the chassis nameplate
- Air flow of at least 350 cubic feet per minute, available in the immediate vicinity of the SAN Director 2/128.
- If installing the switch in an HP rack, or comparable Electronics Industries Association (EIA) rack:
  - All equipment installed in the rack should have a reliable branch circuit ground connection, and should not rely on a connection to a branch circuit, such as a power strip.
  - The rack should be balanced and the installed equipment within the rack's weight limits. Ensure that the rack is mechanically secured to insure stability in the event of an earthquake.

## Cooling Requirements

Install the switch so that air intake and exhaust for all components in the rack is flowing in the same direction.

---

**Note:** To ensure adequate cooling, install the chassis with the port side facing the aisle into which exhaust air is released (usually called the “service aisle”). This prevents the fans from pulling in heated exhaust air.

---

## Power Requirements

Two AC power cords connect to the switch. The AC power source must meet these requirements:

---

**Note:** Installing each power cord using two separate sources ensures power supply redundancy.

---

- 200 to 240 VAC, 50—60 Hertz
- Protected by a circuit breaker in accordance with local electrical codes
- Supply circuit, line fusing, and wire size that are adequate according to the electrical rating on the chassis nameplate
- Grounded AC outlets installed by a licensed electrician and compatible with the power cords

The switch includes a universal power supply capable of functioning worldwide without voltage jumpers or switches. The power supply is auto ranging in terms of accommodating input voltages and line frequencies.

Two jumper cables (C19 – C20) are provided to connect from the switch to the PDU. The recommended PDU is E7671A. Two E7671A PDUs are recommended for power redundancy. The recommended power cords to connect from the PDU to the wall are E7803A, E7805A, E7806A, E7808A, E7809A.

It is not recommended to connect the switch to the wall because it would require two dedicated wall outlets. Using the PDU, a customer can connect more devices to a power source.

## Installing the Switch as a Stand-alone Unit

The following items are required for this setup:

- SAN Director 2/128
- AC power cords and cables supplied with the switch



**Caution:** You must remove the chassis door before lifting the chassis off the pallet. See the next section, [“Removing the Chassis Door”](#) on page 40.

---

## Removing the Chassis Door

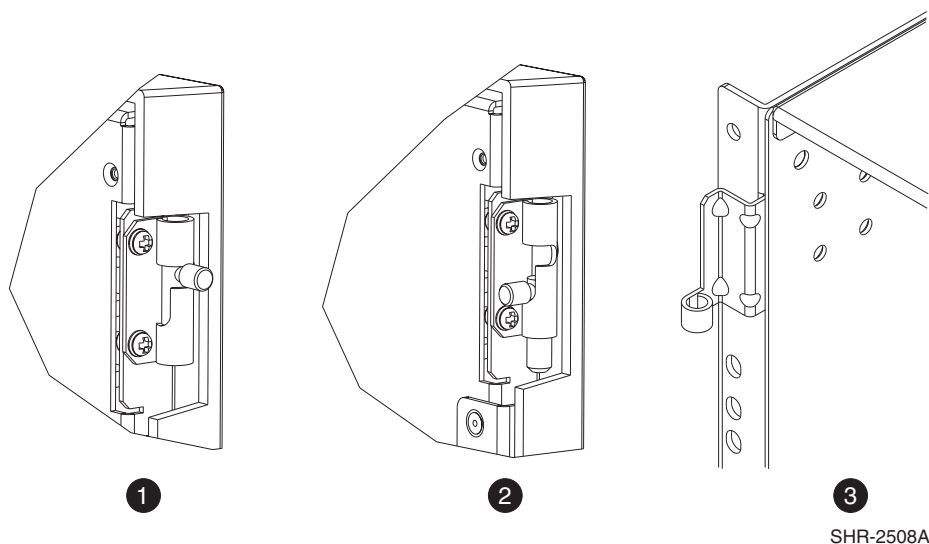
You must remove the chassis door before lifting the switch off the pallet. Use these steps to remove the chassis door.

---

**Note:** To ensure adequate cooling, install the chassis with the port side facing the aisle into which exhaust air is released (usually called the “service aisle”). This prevents the fans from pulling in heated exhaust air.

---

1. Open the door to a 90° angle.
2. Push the spring-loaded lever on the upper hinge up and into the notch in the hinge. See [Figure 4](#).
3. Push the spring-loaded lever on the lower hinge down and into the notch in the hinge, while supporting the door to prevent it from falling. See [Figure 4](#) for the complete chassis door removal sequence.



**Figure 4: Sequence for detaching the chassis door from the hinges**

---

**Note:** Put the chassis door aside. You will need to reinstall it after moving the SAN Director 2/128 off the pallet.

---

4. Position the pallet so that the bottom of the chassis is level with the installation surface.
5. If the chassis is on a pallet jack or lift, stabilize the pallet jack or lift to prevent it from moving during the transfer.



**WARNING:** A fully populated chassis weighs approximately 250 lbs (113 kg) and requires a minimum of two people to safely slide it from one surface to another.

---

## Installing the SAN Director 2/128 on a Flat Surface

Use these steps to install the SAN Director 2/128 on a flat surface.

---

**Note:** The SAN Director 2/128 must be placed on a stable, flat surface, with the blower side of the chassis having access to cool air. Orient the switch so that the port side faces the service aisle.

---

1. Remove the switch chassis door, if you have not already done so. See [Removing the Chassis Door](#), on page 40.
2. Place the SAN Director 2/128 on a flat, sturdy surface like a table or lab bench.
3. Connect the two power cables to the power supply inlets on the switch.

---

**Note:** It is recommended to power the switch using two separate power sources, ensuring redundancy.

---

4. Connect the two power cables to corresponding power outlets. Make sure that the power cable is routed so that it is not exposed to stress.
5. Turn on power to the switch. The switch automatically runs a Power On Self Test (POST).

---

**Note:** Do not connect the switch to the network until the IP address is correctly set.

---

6. Reinstall the chassis door as described in the section [Reinstalling the Chassis Door](#), on page 56.

## Installing the SAN Director 2/128 in a Rack

Read these sections for specific information on installing the SAN Director 2/128 in an HP 10,000 series, HP System/e cabinet, or an EIA comparable cabinet.

### Pre-installation Checklist

Review the following checklist before installing the switch.

- Prepare a site plan.
- Verify that required technical personnel (two technicians) are available and scheduled for the installation.
- Obtain the required fiber-optic cables (multimode or single-mode). Verify cable length and required connectors.
- If applicable, obtain the necessary remote workstations or Simple Network Management Protocol (SNMP) workstations. Workstations are customer-supplied and connected through a corporate or dedicated LAN.
- Verify that the front panel air temperature does not exceed 40°C (104°F) during operation.
- Verify that all equipment installed in the rack has a reliable branch circuit ground connection, and does not rely on a connection to a branch circuit, such as a power strip.
- Verify that the rack is balanced.
- Check that the rack is mechanically secured to insure stability in the event of an earthquake.

### Items Required for Installation

Locate the following items before beginning the install procedure:

- Lift device—a fully populated SAN Director 2/128 weighs approximately 250 lbs. The switch requires a minimum of two people and a hydraulic or assisted lift to aid in moving the switch from the pallet to its operating location.
- Two power outlets—identify one power outlet for each of the two power cords. Installing each power cord at two separate sources ensures power supply redundancy.

- Torque driver—required to secure the 14U Rack Mount Kit hardware to the rack rails.
- Fiber optic protective plugs—for safety and port transceiver protection, Fiber optic protective plugs must be inserted in all SAN Director 2/128 ports without Fiber optic cables attached. The SAN Director 2/128 ships with protective plugs installed in all ports.
- Standard flat-tip and cross-tip Phillips screwdrivers—required to remove, replace, adjust or tighten various FRUs, chassis, or rack components.
- Electrostatic discharge (ESD) grounding strap—required when working in and around the SAN Director 2/128 card cage. Use the ESD strap supplied with the switch.
- Maintenance terminal (desktop or notebook computer)— required to configure SAN Director 2/128 network addresses and acquire event log information through the serial port. Computer requirements include:
  - Microsoft Windows 98®, Windows NT® 4.0, Windows 2000®, or Windows Millennium Edition® operating system installed
  - RS-232 serial communication software (for example, ProComm Plus or HyperTerminal).
- An HP 10,000 series, an HP System/e cabinet or a comparable EIA cabinet with the following specifications:
  - A minimum depth of 29 inches
  - 14 rack units (14U) high
  - 19 inches wide

## Important Rack Mount Guidelines

Review the following rack mount guidelines before proceeding with the installation.



**WARNING:** A fully populated SAN Director 2/128 weighs approximately 250 lbs and requires a minimum of two people and a hydraulic or assisted lift to install it.

Before installing, verify that the additional weight of the chassis does not exceed the rack's weight limits or unbalance the rack, including when some of the cards or power supplies are partially extended out of the chassis.

---

- Check that a minimum distance of 28.25 inches is between the front and back rails.
- Verify that the additional weight of the chassis does not exceed the rack's weight limits.
- Check that all equipment installed in the rack is grounded through a reliable branch circuit connection. Do not rely on a secondary connection to a branch circuit, such as a power strip.
- Verify that the cabinet has enough space. The SAN Director 2/128 is 14U, or 24.11 inches high.
- Verify that the rack is stable.
- M5 Tinnermans (0590-2318) and M5 Torx screws (0515-0671) are required pieces of rack mount kit hardware.
- Plan for cable management before installing the chassis. Cables can be managed in a variety of ways, such as by routing cables below the chassis, to either side of the chassis, or through cable channels on the sides of the rack.
- Verify that the SAN Director 2/128 has access to a minimum airflow of 350 cubic feet per minute.
- Ensure adequate cooling by installing the chassis with the port side facing the aisle into which exhaust air is released (usually called the “service aisle”). This prevents the fans from pulling in heated exhaust air.

## Installing the SAN Director 2/128 in an HP or Comparable EIA Cabinet

Use the following procedure to install the SAN Director 2/128 in an HP 10,000 series, HP System/e or comparable EIA cabinet using the 14U Rack Mount Kit supplied with the switch. Allow approximately 45 minutes to complete this procedure.

---

**Note:** These instructions describe how to install the switch in the bottom area of the rack (section closest to the floor). You may need to orient 14U Rack Mount Kit hardware based on your particular rack's configuration.

---



## Attaching the Rack Mount Shelf Brackets

Use these steps to install the rack mount shelf brackets.



**Caution:** You can install up to two SAN Director 2/128 switches. HP supports up to two SAN Director 2/128 switches in an HP 10,000 series, System\,e, or comparable EIA cabinet.

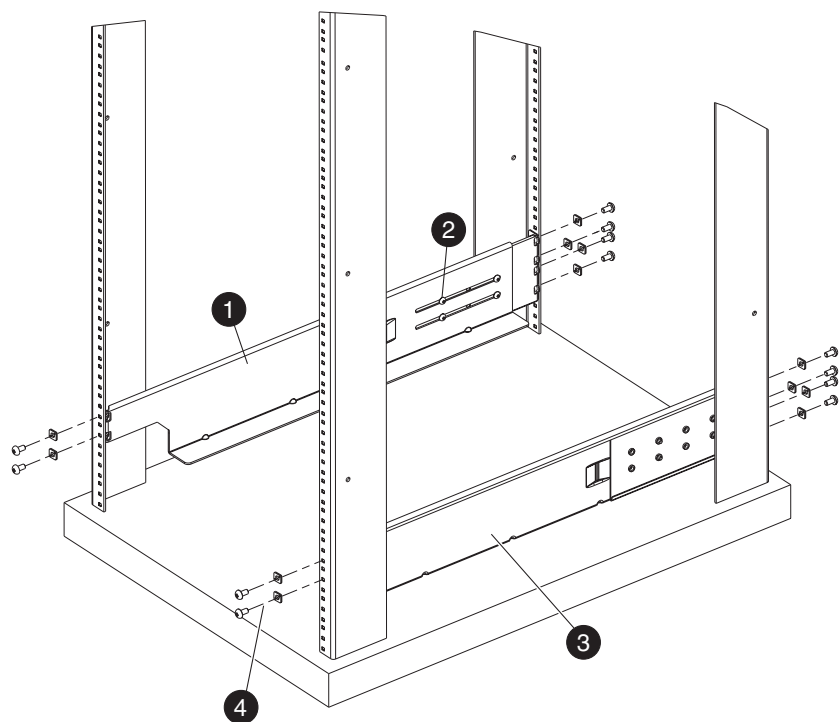
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1. If you have not already done so, remove the chassis door. See “[Removing the Chassis Door](#)” on page 40.
2. Locate the left and right rack mount shelf brackets. Refer to [Figure 3](#) and [Table 5](#) to identify the hardware.
3. Loosen the adjusting screws on the left and right rack mount shelf brackets, and adjust the length of the brackets according to the depth of the rack. See [Figure 5](#).
4. Locate the small, round marker holes on the rack rails. Each marker hole delineates the beginning of one rail unit, or U. Leave 1U of space free at the bottom of the rack.
5. Count up five square holes from the 1U location. Align the left rack mount shelf brackets with the fifth square hole.
6. Attach the rack mount shelf brackets:
  - a. For rails with round holes, position the left and right rack mount shelf brackets with notched portion toward exhaust aisle (see [Figure 5](#)) and attach to cabinet rails, using six 1/4-20 x 0.500-inch (1.27 cm) screws with lock washers per bracket (two on the notched end and four on the other end).
  - b. For rails with square holes, attach the left rack mount shelf bracket to the rack rails using six 1/4-20 x 0.500-inch screws and six square washers. See [Figure 5](#).



**Caution:** All 14U Rack Mount Kit hardware and screws are supplied with the SAN Director 2/128. Use the exact screws specified in the procedure. Using longer screws may damage the chassis.

---



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- |                                 |   |
|---------------------------------|---|
| ❶ Left rack mount shelf bracket | ❸ Right rack mount shelf bracket            |
| ❷ Adjusting screws              | ❹ 1/4-20 x .500-inch screws and washers (6) |

**Figure 5: Installing the left and right rack mount shelf brackets**

7. Tighten the screws to a torque of 80-inch pounds.
8. Repeat [step 5](#) through [step 7](#) to install the right rack mount shelf bracket.

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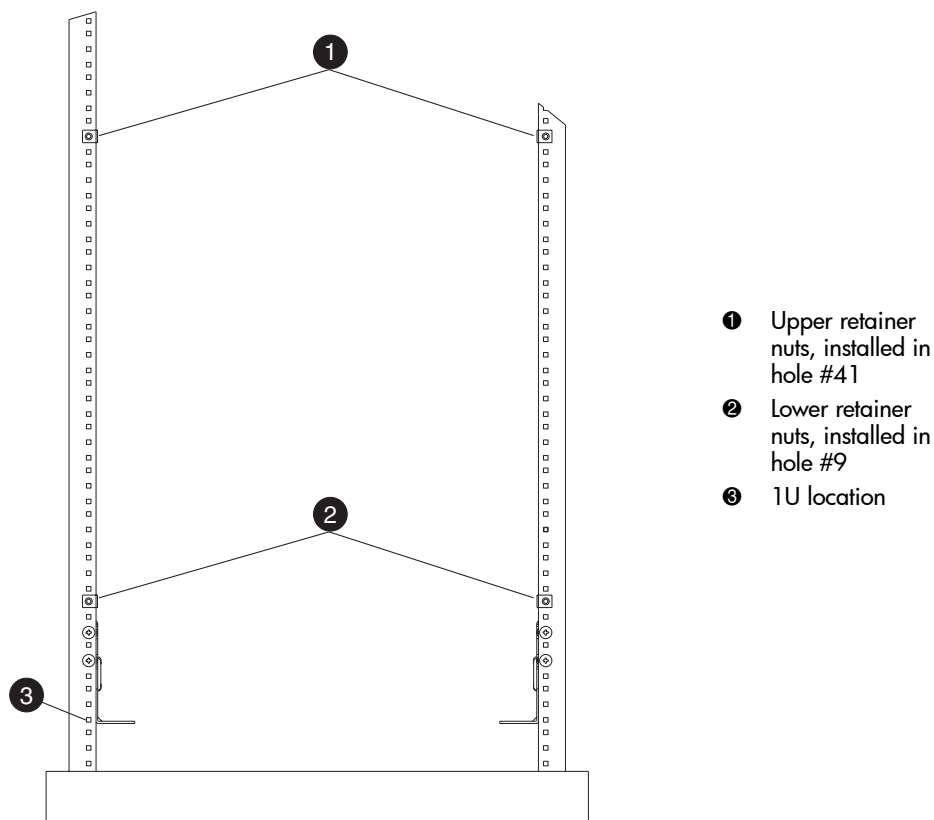
**Note:** When finished securing the rack mount shelf brackets, remember to tighten the adjustment screws you loosened in [step 3](#), and torque to 32 inch-pounds.

---

## For Rails with Square Holes—Attaching the Retainer Nuts

If installing the 14U Rack Mount Kit in rails with square holes (like the HP 10,000 Series, 42U rack), attach retainer nuts to vertical rails on service side of the rack as follows.

1. First, count up forty one square holes from the 1U location.
2. Attach the four retainer nuts to the two rails at the front of the rack (service aisle side). See [Figure 6](#).



**Figure 6: Installing the retainer nuts on the rails**

## For Rails with Round Holes—Attaching the Clip Nuts

If installing the 14U Rack Mount Kit in rails with round holes, refer to this section. Attach the clip nuts to the vertical rails on the service side of the rack as follows.

- Use the clip nuts for rails with round holes only.
  - Refer to the section [For Rails with Square Holes—Attaching the Retainer Nuts](#), on page 49 if installing the switch in rack rails with square holes.
1. Count up 41 round holes from the 1U location.
  2. Attach the four clip nuts to the two rails at the front of the rack (service aisle side). See [Figure 6](#).

---

**Note:** Cables can be routed down through the cable management tray or through the holes in the sides of the chassis. If the cables will be routed down through the cable management tray, allow adequate space below the chassis for cable management.

---

## Attaching the Upper Rack Mount Bracket Assemblies to the Chassis

Use these steps to attach the upper rack mount brackets to the chassis. The upper rack mount bracket assemblies consist of the following:

- One right flat upper rack mount bracket attached to an L-shaped bracket
- One left flat upper rack mount bracket attached to an L-shaped bracket

---

**Note:** To complete this procedure, you must first detach the L-shaped brackets from the upper rack mount bracket assemblies.

---

1. Use a Phillips head screwdriver to remove the screws securing the left and right upper rack mount brackets to the L-shaped brackets. Detach the L-shaped brackets from the assembly and put them aside.

---

**Note:** You reinstall the L-shaped brackets to the rack rails in [step 5](#).

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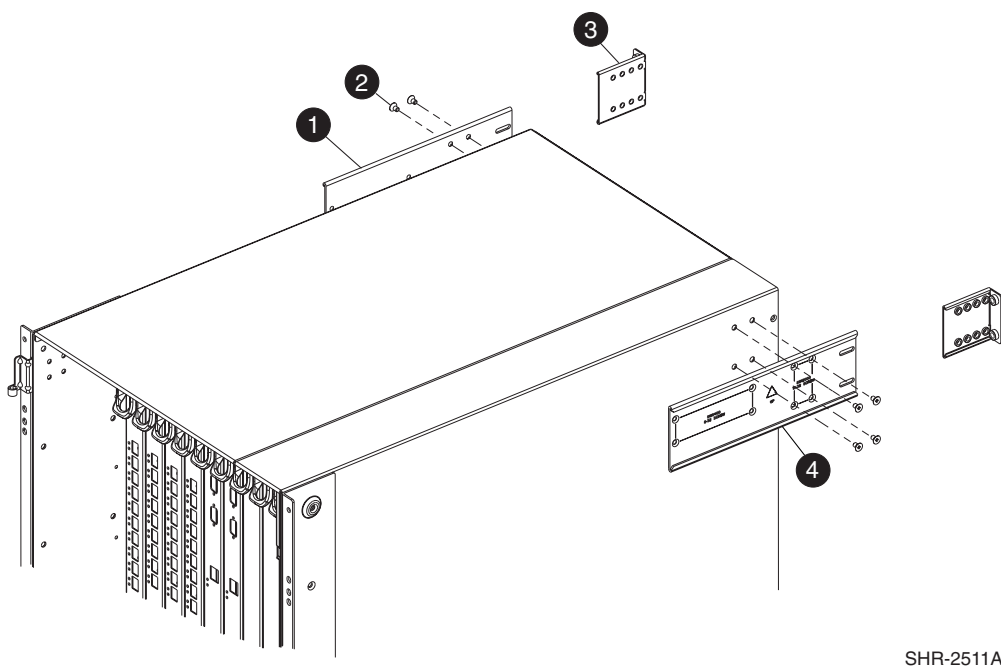
2. Save the screws for attaching the bracket assemblies to the chassis (see [step 1](#) in the section [Securing the Chassis to the Rails](#) on page 54).

3. Use four #10-32 x 5/16 inch screws to secure the right and left flat upper rack mount brackets to the chassis. See [Figure 7](#).

---

**Note:** Orient the slotted holes in the brackets toward the blower side of the chassis (see [Figure 7](#) for orientation).

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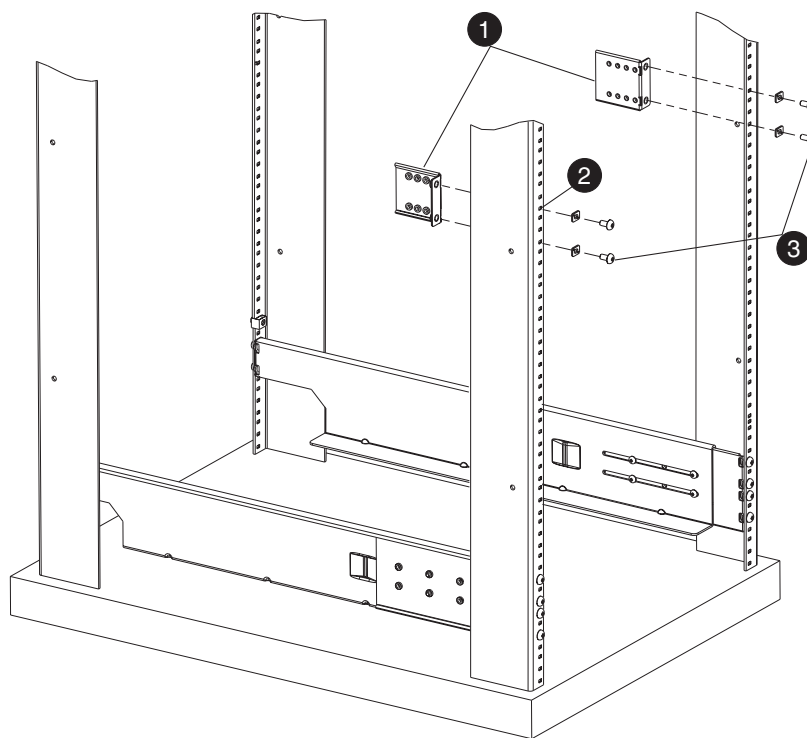
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- |                                      |                                       |
|--------------------------------------|---------------------------------------|
| ❶ Left flat upper rack mount bracket | ❸ Detached L-shaped brackets (1 of 2) |
| ❷ #10-32 x 5/16 inch screws (4)      | ❹ Right flat upper rack mount bracket |

**Figure 7: Attaching the left and right flat upper rack mount brackets**

4. Tighten the screws and torque to 32 inch-pounds.

5. Attach the two L-shaped brackets to the rack rails farthest from the service aisle. See [Figure 8](#).
  - For rails with square holes:  
Attach the two L-shaped brackets to the rack rails with two of the #1/4-20 x 1/2 inch Phillips panhead screws and two square washers per bracket. Tighten the screws to a torque of 80 inch-pounds.
  - For rails with round holes:  
Attach the two L-shaped brackets to the rack rails using two of the #1/4-20 x 1/2 inch Phillips panhead screws (Item 8) per bracket. Tighten the screws to a torque of 80 inch-pounds.
6. Route any cables or cords through the cabinet or along any other route that will be difficult to reach after the chassis is installed. Leave enough cable allowance to plug and unplug cables from switch.



- ❶ Two L-shaped brackets
- ❷ Aligning top screw in hole #37
- ❸ 1/4-20 x 1/2 inch Phillips panhead screws and square washers

**Figure 8: Attaching L-shaped brackets to rails**



## Finalizing the Rack Mount Procedure

Read these sections to install the SAN Director 2/128 into the HP 10,000 series, HP System\le or comparable EIA cabinet.



**WARNING:** A fully populated SAN Director 2/128 weighs approximately 250 lbs and requires a minimum of two people and a hydraulic or assisted lift to install it.

Before installing, verify that the additional weight of the chassis does not exceed the rack's weight limits or unbalance the rack, including when some of the cards or power supplies are partially extended out of the chassis.

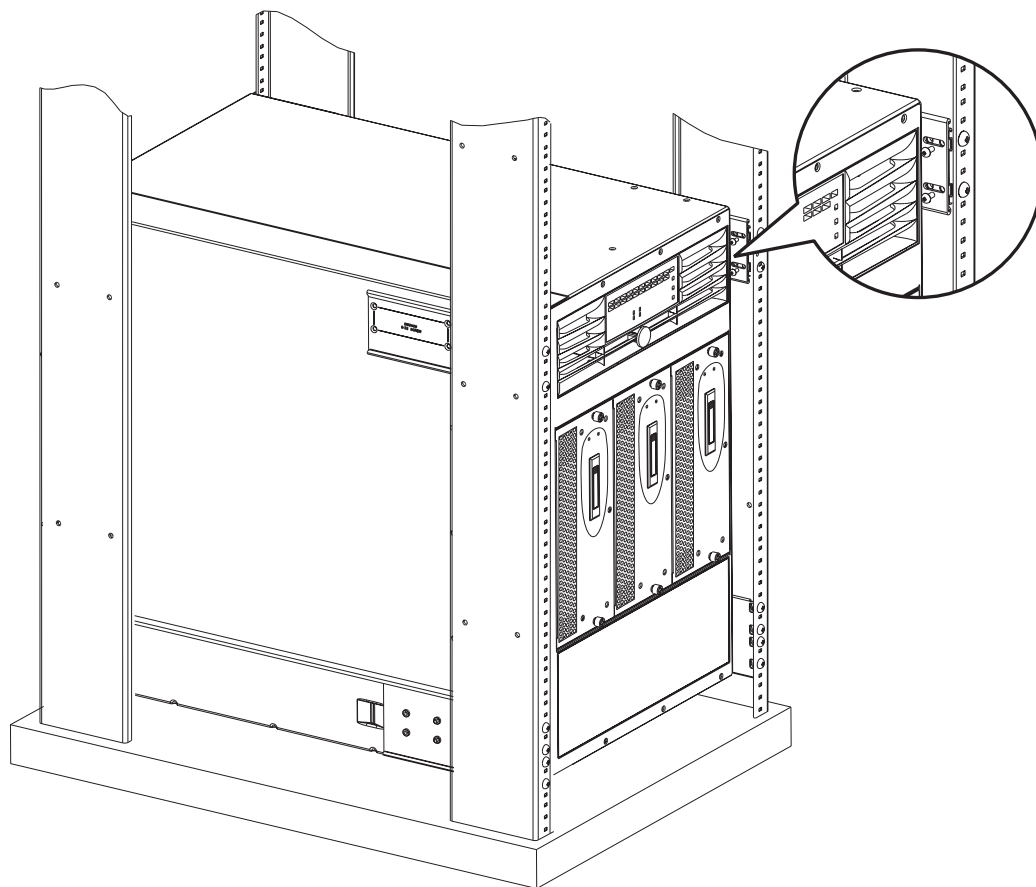
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### Sliding the Switch into the Rack

1. Before lifting the chassis into the rack, determine an easy access route for cables or cords. Make sure that cables do not get pinned under the weight of the chassis.
2. Position the lift device next to the SAN Director 2/128.
3. Position one technician at the front of the chassis, and the second technician at the rear of the chassis. Carefully move the chassis onto the lift device.
4. Use the lift-assist device to raise the chassis until the bottom of the chassis is level with the shelf-like surfaces of the rack mount shelf brackets.
5. Slide the chassis onto the two rack mount shelf brackets.

### Securing the Chassis to the Rails

1. Attach the two flat upper rack mount brackets (that you installed on the chassis earlier) to the two L-shaped brackets installed onto the rack rails. Use the two screws set aside in [step 1](#) of the section [Attaching the Upper Rack Mount Bracket Assemblies to the Chassis](#) on page 50. See [Figure 9](#).

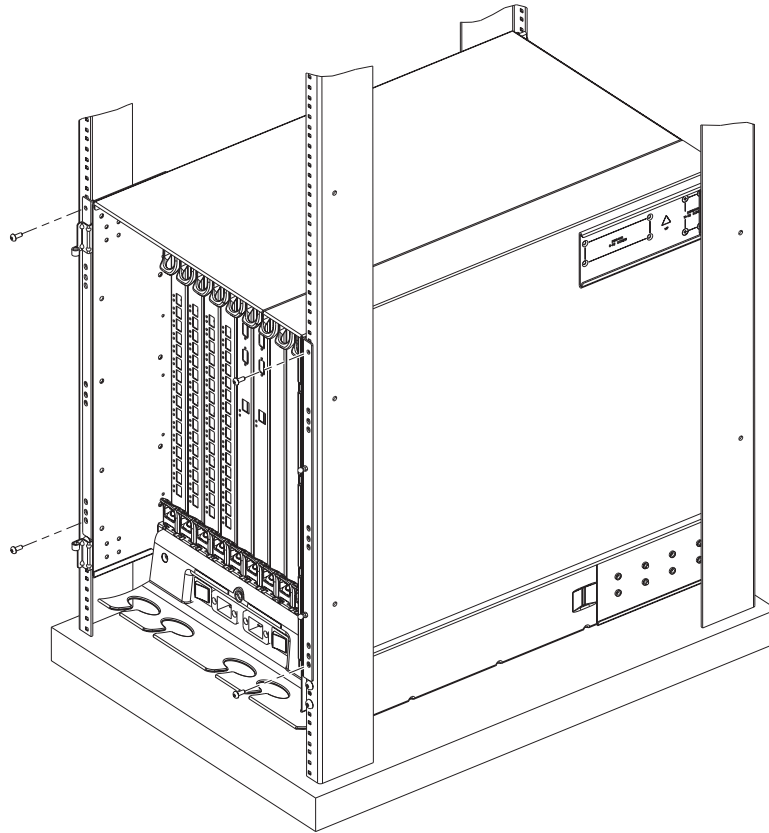


SHR-2513A

**Figure 9: Attaching the upper rack mount bracket to the L-shaped brackets**

2. Tighten screws, and torque to 32 inch-pounds.

3. Secure the chassis port side to the rack rails using two #10-32 x 5/8 inch screws on each side.



SHR-2514A

**Figure 10: Securing the chassis port side to rack rails**

4. Tighten the screws, and torque to 32 inch-pounds. See [Figure 10](#) for screw locations.

#### **Reinstalling the Chassis Door**

1. Verify that the spring-loaded pins on both door hinges are retracted (push levers into notches).
2. Align the door hinges with the chassis portion of the hinges.
3. Push the levers out of the notches to release the pins.

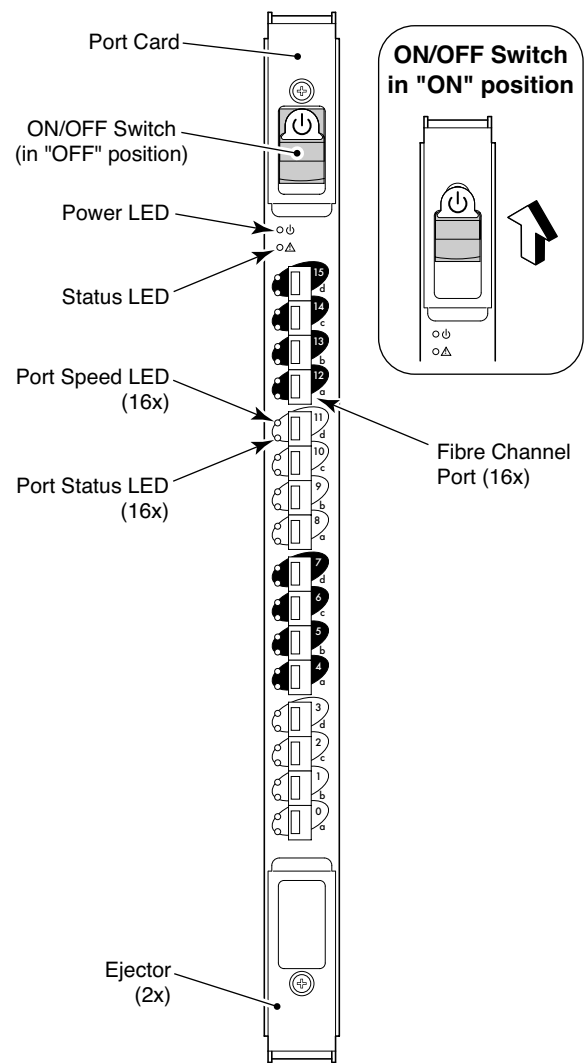
## Powering on the SAN Director 2/128

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**Note:** If a modem is to be used with the SAN Director 2/128, it needs to be connected prior to powering on the switch. To install a modem, refer to “[Setting Up and Installing Modems](#)” on page 153.

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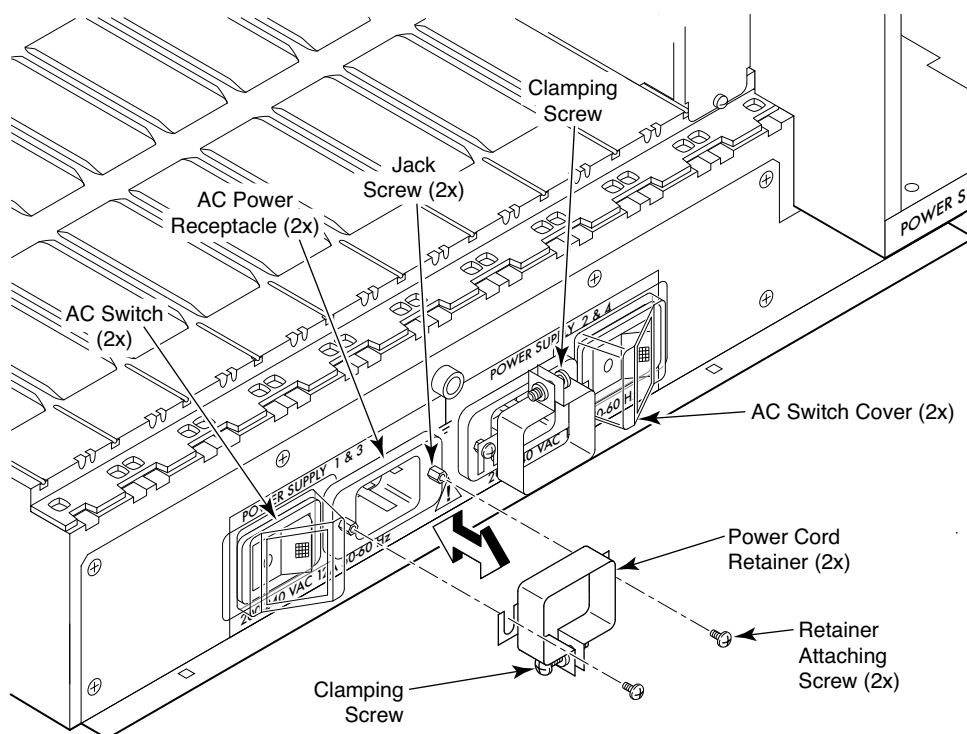
1. Verify that the ON/OFF switches for each 16-port card and CP card are in the ON position (see [Figure 11](#)).



**Figure 11: ON/OFF switch for a 16-port card**

**Note:** The ON/OFF switch for CP cards is identical to the ON/OFF switch on the 16-port card in [Figure 11](#).

2. Verify that the AC switch covers are installed over the AC switches. These clear plastic covers fit over the AC switches with their edges tucked underneath the outlet covers, preventing the AC switches from being powered on or off accidentally (see [Figure 12](#)).
3. Connect the AC power cord retainers to the chassis: orient a retainer against the AC panel as shown in [Figure 12](#). Place the retainer tabs under the two jack screws on either side of the power receptacle and tighten the screws.
4. Repeat for the other retainer (note that the power cord retainers are oriented in the same direction as the power receptacles).



**Figure 12: AC panel and power cord retainers**

5. Loosen the clamping screw on each retainer, insert the power cords through the retainers into the power receptacles on the SAN Director 2/128, and tighten the clamping screws. The power cords are designed with left bends, so each should route to opposite sides of the chassis.

6. Ensure that the power cord has a minimum service loop of 6 inches available at the connection to the switch and is routed so that it is not exposed to stress.
7. Connect the power cords to a power source with voltage of 200 to 240 VAC, 50 to 60 Hz.
8. Position AC power switches to “1.” The AC power switches light up green when switched on and power is supplied.

---

**Note:** The switch automatically performs a power-on self-test (POST) by default each time it is powered on. POST takes approximately 10 minutes and is complete when indicator light activity returns to its standard state. For information about LED patterns, see [“Interpreting LED Activity”](#) on page 82).

---



**Caution:** To prevent a potential IP address conflict, do not connect the SAN Director 2/128 to the network until the IP addresses are configured. See [“Initial Configuration Parameters”](#) on page 67 for additional information.

---

## Establishing a Serial Connection

The initial communication to a SAN Director 2/128 switch requires a serial connection. Follow these steps to establish a serial connection and log in to the switch:

1. Verify that the SAN Director 2/128 is powered on and that POST is complete by verifying that all power LED indicators on the 16-port cards and CP cards are displaying a steady green light.
2. Use the serial cable provided with the SAN Director 2/128 to connect the console port on the active CP card to a computer workstation.

The console port is the second serial port from the top of the CP card; the active CP card is indicated by an illuminated (blue) LED (see “CP Cards” on page 86). The “Active CP” LED in the standby CP card should be off (not illuminated).

---

**Note:** The console port is intended primarily for use during the initial setting of the IP address and for service purposes. If necessary, the adapter on the serial cable can be removed to allow for an RJ45 serial connection.

---

3. Access the switch using a terminal emulator application (such as HyperTerminal on Windows 95<sup>®</sup>, 2000<sup>®</sup>, or NT<sup>®</sup>, or TERM in a UNIX<sup>®</sup> environment).

---

**Note:** The SAN Director 2/128 supports up to two telnet sessions with administrative privileges at the same time.

---

4. Disable any serial communication programs running on the workstation (such as synchronization programs).
5. Open the terminal emulator application and configure as follows:
  - Bits per second: 9600
  - Databits: 8
  - Parity: None
  - Stop bits: 1
  - Flow control: None



6. When the terminal emulator application stops reporting information, press **Enter**.
7. Log in to the switch as admin. The default password is *password*.

---

**Note:** At the initial login, the user is prompted to enter new admin and user passwords.

---

8. Modify passwords, if desired. Passwords can be 8 to 40 characters long and should include a combination of numbers and upper/lowercase letters. To skip modifying the password, press **Ctrl-C**.

**Example:**

```
Fabric OS (swDir)

swDir login: admin
Password:
Please change your passwords now.
Use Control-C to exit or press 'Enter' key to proceed.

Password was not changed. Will prompt again at next login
until password is changed.
swDir:admin>
```

9. Check the “Active CP” LED on the CP cards in slots 5 and 6 (see [Figure 11](#)), or enter the `haShow` command to verify which CP card is active.

The configuration can be modified only through a login session to the active CP card.

**Example:**

```
swDir: admin> haShow
Local CP (Slot 6, CP1): Active
Remote CP (Slot 5, CP0): Standby
HA Enabled, Heartbeat Up, State Synchronized
```

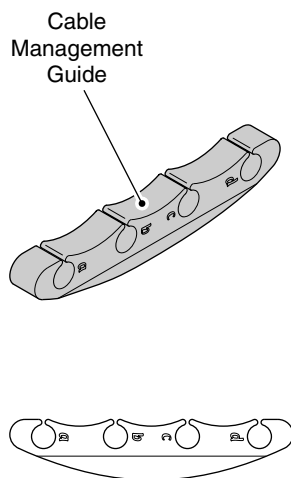
## Managing Cables

The SAN Director 2/128 cables can be managed in a variety of ways, including the following:

- Routed down through the cable management tray
- Routed out either side of the chassis
- Cable channels on the sides of the cabinet
- Patch panels

Two items are provided to assist with cable management:

- **Cable Management Tray**—The cable management tray is attached to the bottom of the chassis (see [Figure 12](#)) and can be used to route the power cables and other cables down below the chassis or out the sides of the chassis. Routing the cables down through the holes in the management tray requires minimum of 3U (rack units) below the switch.
- **Cable Guides (Pillars)**—A set of 16 cable guides (pillars) are provided with the SAN Director 2/128 and can be used to organize the port cables into logical groups, such as according to port quads (sets of four neighboring ports). The cable guides do not attach to the chassis (see [Figure 13](#)).



**Figure 13: Cable guide (pillar)**

The cable guides serve to keep the cables evenly spaced and to hold them away from the port cards, making card replacement easier and preventing the cables from bending to less than the minimum bend radius.



**Caution:** Do not route the cables in front of the air exhaust vent, which is located at the top of the port side of the chassis. Arrange the cables so that the minimum bend radius is not exceeded; for a 50-micron cable, the minimum bend radius is 2 inches under full tensile load and 1.2 inches with no tensile load. Tie wraps are not recommended for optical cables because they are easily overtightened and can break the optical cables.

---

To keep LEDs visible and make it easy to replace components, route cables down in front of the cards, not across adjacent cards or in front of the power supplies. [Figure 14](#) provides an example in which cables for each card are routed in front of that card and are out of the way of other components.

Leave at least one meter of slack for each fiber optic cable. This provides room to remove and replace the port card, allows for inadvertent movement of the rack, and helps prevent the cables from being bent to less than the minimum bend radius.

Use the cable guides provided with the SAN Director 2/128 to group the cables. These guides help to keep individual ports accessible by keeping the cables evenly spaced. If ISL Trunking is in use, grouping the cables by trunking group is recommended. The ports are color-coded to indicate which ports can be used in the same ISL Trunking group: four ports marked with solid black ovals alternate with four ports marked with oval outlines.

---

**Note:** ISL Trunking is a Fabric OS feature that enables distribution of traffic over the combined bandwidth of up to four ISLs between two directly adjacent switches, while preserving in-order delivery. For more information, refer to the *HP StorageWorks Features 4.2.x User Guide*.

---

Due to the wavelengths used in transmitting data, a minimum length is required for cables that connect the SAN Director 2/128 ports to device ports, as follows:

- 9 microns, single-mode (SM) — 2 meters
- 50 microns, multimode (M5) — 2 meters
- 62.5 microns, multimode (M6) — 2 meters

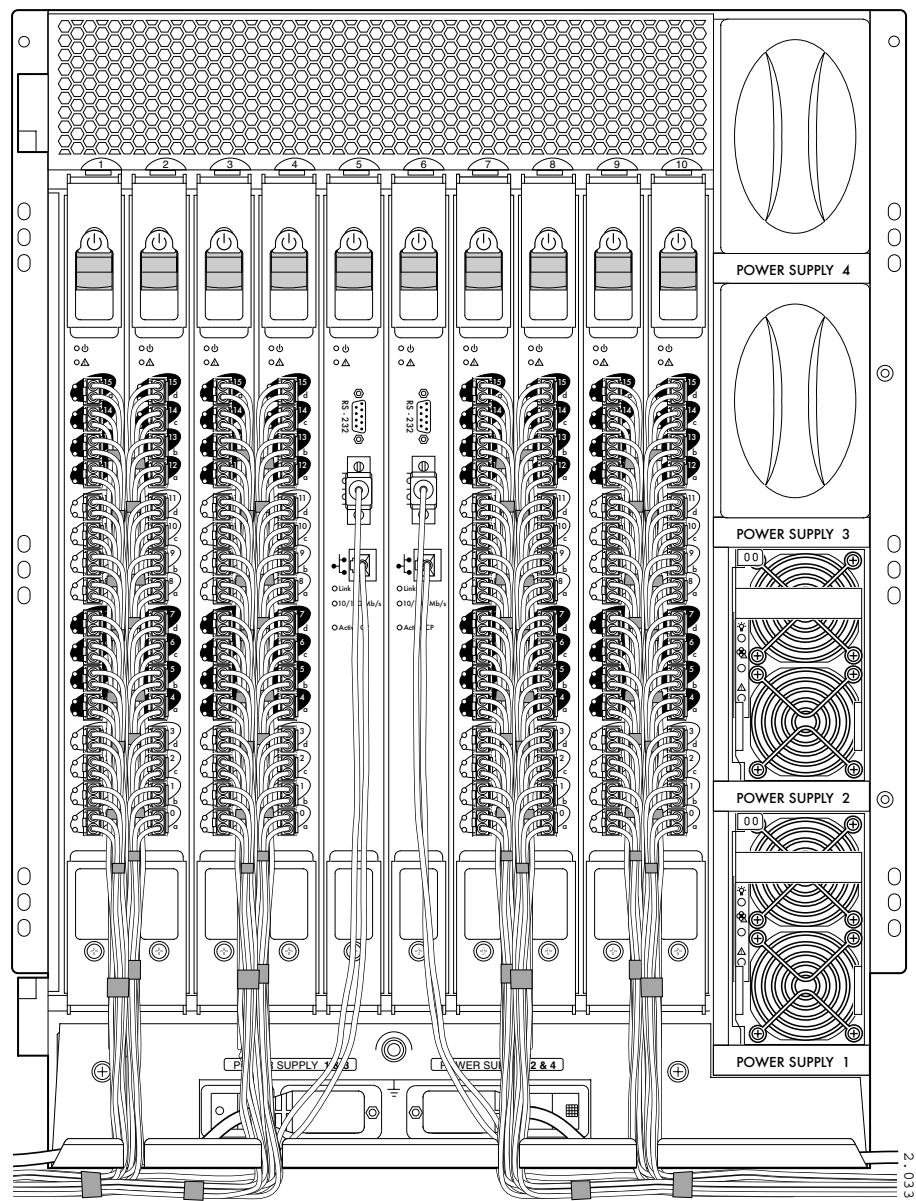


Figure 14: Effective cable management

## Initial Configuration Parameters

The SAN Director 2/128 must be configured before it is connected to the fabric. Configuration commands must be entered through the active CP card. The SAN Director 2/128 configuration includes the following parameters:

- IP addresses (or “native” IP address), host names, subnet masks, and gateway addresses for both CP cards
- IP address and subnet mask for the SAN Director 2/128
- Director name
- Switch status policies
- Domain ID for the SAN Director 2/128 (optional)
- WWN for the SAN Director 2/128

---

**Note:** The SAN Director 2/128 WWN is initially set by the factory to match the license ID (which is based on the chassis serial number). The WWN can be changed, but the license ID cannot be modified.

---

The configuration information is automatically mirrored to the standby CP card—allowing the most current configuration to remain available even if the active CP card fails. The configuration information for the switch is stored in the WWN card and the flash memory of the CP cards. The configuration can be backed up to a workstation (uploaded) and then downloaded to the active CP card if necessary.

The basic steps required for the initial configuration are:

1. Log in to the switch (see [“Establishing a Serial Connection”](#) on page 61).
2. Set up IP addresses (see [“Configure IP Addresses for CP Cards”](#) on page 69 and [“Configure IP Address for the Switch”](#) on page 71).
3. Establish an Ethernet connection (optional). See [“Establish an Ethernet Connection”](#) on page 72.
4. Specify switch name (see [“Customize a Switch Name”](#) on page 73).
5. Set up switch status policies (see [“Specify Status Policies”](#) on page 74).
6. Specify domain ID for the switch (see [“Set the Domain ID”](#) on page 75).

7. Connect to the fabric and establish fabric parameters, including PID settings (refer to “[Connect to the Fabric and Configure Fabric Parameters](#)” on page 76).
8. Enable software licenses, as necessary (refer to “[Enable Software Licenses](#)” on page 78).
9. Back up the configuration (refer to “[Back Up the Configuration](#)” on page 79).

Refer to the *HP StorageWorks Fabric OS 4.2.x Command Reference Guide* for additional information about these commands.

## Configure IP Addresses for CP Cards

The SAN Director 2/128 Director requires three IP addresses, which are configured using the `ipAddrSet` command. IP addresses are required for both CP cards (CP0 and CP1) and the SAN Director 2/128.

---

**Note:** Use a block of three IP addresses that are consecutively numbered in the last octet. The IP and gateway addresses must reside on the same subnet.

Resetting an IP address while the switch is online breaks any connections to that IP address and forces a restart of any HTTP, SNMP, and API daemons.

The addresses 10.0.0.0 - 10.0.0.255 are reserved and used internally by the switch.

---

The default IP addresses and host names for the SAN Director 2/128 are as follows:

- 10.77.77.75 CP0 (the CP card in slot 5 at the time of configuration)
- 10.77.77.74 CP1 (the CP card in slot 6 at the time of configuration)

Configuration changes can only be made via the active CP card. If the CP card in slot 5 is not the active CP card, disconnect the serial cable and connect it to the CP card in slot 6; then log in as admin.

Follow these steps to configure the IP addresses for both CP cards (from the active CP card):

1. Enter the `ipaddrset` command at the prompt, including “2” for the CP card in slot 5 or “3” for the CP card in slot 6.

**Example:**

```
swDir:admin> ipAddrSet -cp 2
```

2. Enter the requested information at the prompts. The default information for the CP card in slot 5 is displayed.

**Example:**

```
Ethernet IP Address [10.77.77.75]:  
Ethernet Subnetmask [255.0.0.0]:  
Host Name [CP0]:  
Gateway Address [0.0.0.0]:
```



---

**Note:** The host name is the name assigned to the CP card. The same gateway address must be used for both CP cards (these gateway addresses are referenced for the IP addresses).

---

3. Press **Enter** to update the IP address of the active CP card immediately.
4. Repeat these steps to configure the IP address of the standby CP card.  
The IP address of the standby CP card is updated at the next reboot.

## Configure IP Address for the Switch

The SAN Director 2/128 has its own IP address and corresponding subnet mask. The default IP address is 10.77.77.77.



**Caution:** Resetting an IP address while the SAN Director 2/128 has active IP traffic such as Fabric Manager, Fabric Watch, SNMP can cause traffic to be interrupted or stopped. Changing the IP address causes a domain address format RSCN to be issued.

---

Follow these steps to configure the IP address for the SAN Director 2/128 (from the active CP card):



**Caution:** Configuration changes can only be made via the active CP card. If the CP card in slot 5 is not the active CP card, disconnect the serial cable and connect it to the CP card in slot 6, then log in as admin.

---

1. Enter `ipAddrSet` at the prompt.
2. Enter the requested information for this IP address at the prompts.

**Example:**

```
Ethernet IP Address [10.77.77.77]:  
Ethernet Subnetmask [0.0.0.0]:  
Fibre Channel IP Address [none]:  
Fibre Channel Subnet Mask [none]:
```

The IP address is updated immediately.

3. Reboot the CP card by entering the `reboot` command at the prompt.



**Caution:** The terminal serial port can be used to monitor error messages through a serial connection. It is not recommended as a command interface during normal operations. If this port is not going to be in ongoing use, remove the serial cable and protect the port from dust by replacing the shipping cap.

---

## Establish an Ethernet Connection

After using a serial connection to configure the IP addresses for the SAN Director 2/128 (see “[Configure IP Addresses for CP Cards](#)” on page 69 and “[Configure IP Address for the Switch](#)” on page 71), you can connect the active CP card to the local area network (LAN) if desired.

---

**Note:** Connecting the CP cards to a private network/VLAN is recommended.

---

By establishing an Ethernet connection, you can complete the SAN Director 2/128 configuration using either the serial session or a telnet session. However, you must ensure that the SAN Director 2/128 is not modified from other connections at the same time.

To establish an Ethernet connection to the SAN Director 2/128, follow these steps:

1. Remove the shipping plug from the Ethernet port on the active CP card.
2. Insert one end of an Ethernet cable into the Ethernet port.
3. Connect the other end to an Ethernet 10/100 Base-T LAN.

The SAN Director 2/128 can now be accessed by remote connection using any of the available management tools, such as telnet or Fabric Manager.

4. To complete any additional SAN Director 2/128 configuration procedures through a telnet session, log in to the switch by telnet, using the admin login. The default password is “password”.

## Customize a Switch Name

The *switch* name of the SAN Director 2/128 Director can be up to 15 characters long; can include alpha, numeric, and underscore characters; and must begin with an alpha character. The default name for the SAN Director 2/128 is “swDir”. Including “swDir” in the name is recommended to allow easy identification.

To customize the name, follow these steps:

1. Enter the `switchname` command with the new name in quotes.

**Example:**

```
swDir:admin> switchName "sw10"
```

For details about the `switchname` command, refer to the *HP StorageWorks Fabric OS 4.2.x Command Reference Guide*.

2. Record the new name for future reference.

---

**Note:** Changing the name causes a domain address format RSCN to be issued.

---

## Specify Status Policies

To specify custom status policies, follow these steps:

1. Enter the `switchstatuspolicyset` command at the prompt.  
For more information about the `switchstatuspolicyset` command, refer to the *HP StorageWorks Fabric OS 4.2.x Command Reference Guide*.
2. Complete the prompts to specify the desired policies.

---

**Note:** To completely deactivate an alarm for a particular condition, enter “0” at the corresponding prompt.

---

## Set the Domain ID

Each switch in the fabric must have a unique Domain ID. The Domain ID can be set using the **configure** command. It is also possible to allow the Domain ID to be automatically set.

---

**Note:** The default Domain ID for the SAN Director 2/128 is “1”.

---

To set the Domain ID, follow these steps:

1. Enter the `fabricshow` command to determine the current Domain IDs available.
2. Enter the `switchdisable` command to disable the SAN Director 2/128.
3. Enter the `configure` command.
4. Enter **y** at the “Fabric parameters” prompt:

```
Fabric parameters (yes, y, no, n): [no] y
```

5. Enter a unique Domain ID:

```
Domain: (1..239) [1] 3
```

6. Complete the remaining prompts or press **Ctrl+D** to accept the other settings and exit.
7. Enter the `switchenable` command to reenabling the SAN Director 2/128.

## Connect to the Fabric and Configure Fabric Parameters

Before connecting the SAN Director 2/128 to the fabric, verify that all the switches in the fabric use the correct port identifier (PID) settings. For information on setting the PIDs, refer to the *HP StorageWorks Fabric OS 4.2.x Procedures User Guide*.

To connect the SAN Director 2/128 to the fabric, follow these steps:

1. Add SFP transceivers and cables to the fibre channel ports, as required.

The ports are color-coded to indicate which ones can be used in the same trunking groups: four ports marked with solid black ovals alternate with four ports marked with oval outlines. The ports and cables used in trunking groups must meet specific requirements. For a list of these requirements, refer to the “ISL Trunking” section of the *HP StorageWorks Features 4.2.x User Guide*.

2. Position one of the SFP transceivers so that the key is oriented correctly to the port. Insert the transceiver into the port until it is firmly seated and the latching mechanism clicks.

Transceivers are keyed so that they can only be inserted with the correct orientation. If a transceiver does not slide in easily, ensure that it is correctly oriented. For instructions that are specific to the transceiver model, refer to the transceiver manufacturer’s documentation.

3. Position a cable so that the key (the ridge on one side of the cable connector) is aligned with the slot in the transceiver; then, insert into the transceiver until the latching mechanism clicks.

Cables are keyed so that they can only be inserted with the correct orientation. If a cable does not slide in easily, ensure that it is correctly oriented.

4. Repeat step 1 through step 3 for the remaining ports.
5. Organize the cables as required. For recommendations regarding cable management, refer to the [“Managing Cables”](#) on page 63.
6. Check the SAN Director 2/128 for switch and port status by entering the `switchshow` command at the prompt.

The `switchshow` command provides detailed information about the switch. For more information about this command, refer to the *HP StorageWorks Fabric OS 4.2.x Command Reference Guide*.

7. Check the fabric for ISLs, switch names, or other status by entering the `fabricshow` command at the prompt.

The `fabricshow` command provides general information about the fabric. For details about this command, refer to the *HP StorageWorks Fabric OS 4.2.x Command Reference Guide*.

8. To establish additional system parameters, use the `configure` command. For details about this command, refer to the *HP StorageWorks Fabric OS 4.2.x Command Reference Guide*.



## Enable Software Licenses

To determine which licenses are currently enabled, enter the `licenseShow` command.

The 64-bit chassis ID is required to obtain and activate licenses for the SAN Director 2/128. The chassis ID is available through the command `licenseidShow`.

Both the `licenseShow` and `licenseidShow` commands must be entered through the active CP card.

For information about activating licenses, refer to the *HP StorageWorks Fabric OS 4.2.x Procedures User Guide*.

## Back Up the Configuration

It is recommended that you save all key configuration data for the SAN Director 2/128—including license key information—and upload it to a host for emergency reference. Routine backups of the configuration are recommended to ensure the current configuration is available if needed.

After all zoning configurations and other changes are complete, back up the configuration by entering the `configupload` command at the prompt.

The `configupload` command uploads the SAN Director 2/128 configuration to the server so that it is available for downloading to a replacement switch, if necessary. For more information about this command, refer to the *HP StorageWorks Fabric OS 4.2.x Command Reference Guide*.

---

**Note:** Refer to the *HP StorageWorks Fabric OS 4.2.x Procedures User Guide* for information about using the `configdownload` command.

---

# Operating the SAN Director 2/128

## 3

The SAN Director 2/128 is engineered for reliability and requires no routine operational steps or maintenance.

This chapter provides the following information:

- [Interpreting LED Activity](#), page 82
- [Diagnostics and Troubleshooting Overview](#), page 98
- [Obtaining Chassis and Component Status](#), page 99
- [Interpreting POST and Boot Results](#), page 100
- [Diagnostics](#), page 102
- [Troubleshooting the SAN Director 2/128](#), page 103

Refer to the following sections for LED and CLI information about each SAN Director 2/128 component:

- [16-Port Cards](#), page 82
- [CP Cards](#), page 86
- [Power Supplies](#), page 89
- [Blower Assemblies](#), page 92
- [WWN Card](#), page 95

You can also set up monitoring alerts using SNMP, syslog, Advanced Web Tools, or optional software features (for example Fabric Watch, and Advanced Performance Monitoring).

---

**Note:** Refer to the *HP StorageWorks Fabric Watch 4.2.x User Guide*, the *HP StorageWorks Advanced Web Tools 4.2.s User Guide*, and the *HP StorageWorks Fabric OS 4.2.x Features User Guide* (includes Advanced Performance Monitoring) for additional information.

---

## Interpreting LED Activity

System activity and status can be determined through the activity of the LED indicators on the switch. There are three possible LED states:

- No light
- Steady light, in one of the following colors:
  - Green
  - Orange (also referred to as amber in related documentation)
  - Yellow (appears when both green and orange LED elements are lit)
- Flashing light (green, orange, or yellow)

The LEDs may flash green, yellow, or orange while the switch is booting or while POST or other diagnostic tests are running. This is normal, and does not indicate a problem unless the LEDs do not indicate that all components are operational after boot process, POST, and any diagnostic tests are complete.

## 16-Port Cards

To determine the status of a 16-port card:

1. Check the LED indicators on the port card (see [Figure 15](#)). The LED patterns may temporarily change during POST and other diagnostic tests. For information about how to interpret the LED patterns, refer to [Table 6](#).
2. Check the 16-port card status using the `slotshow` command (see [Obtaining Chassis and Component Status](#), page 99 for an example).

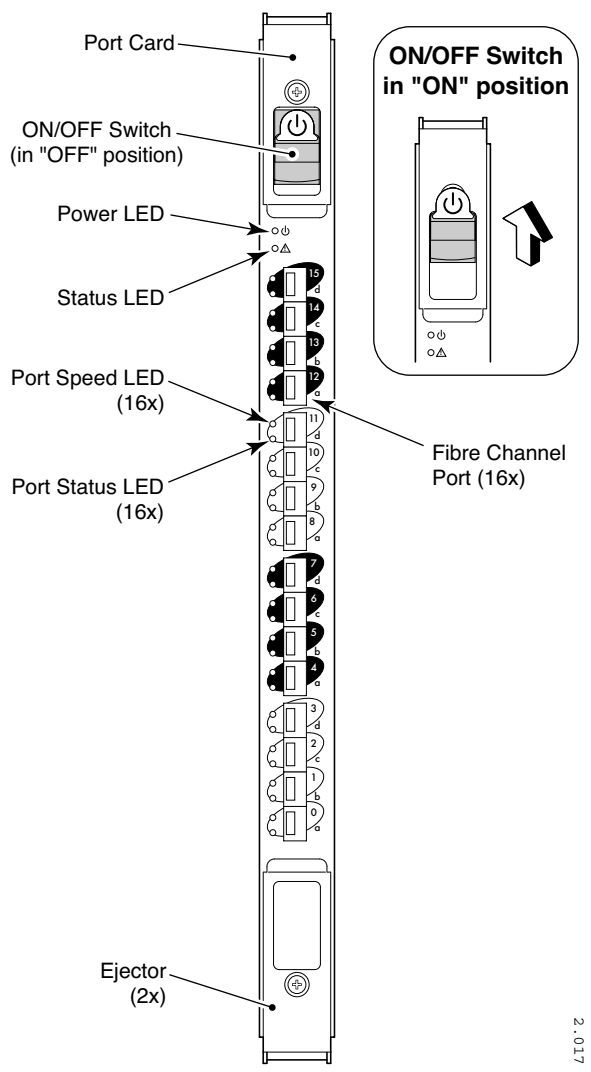




Figure 15: Front of 16-port card

2.017

**Table 6: 16-Port Card LED Patterns**

LED Location/ Purpose	Color	Status	Recommended Action
Power 	Steady green	Port card receiving power.	No action required.
	No light (LED is off)	Port card is not receiving power.	Ensure card is firmly seated and has power.
Status 	No light (LED is off)	Port card is either healthy or does not have power.	Verify that the power LED is on.
	Steady yellow	Port card is faulty.	Ensure card is firmly seated and check status with <code>slotshow</code> command. If LED remains yellow, consult switch supplier.
	Slow-flashing yellow (on 2 seconds; then off 2 seconds)	Port card is not seated correctly or is faulty.	Pull card out and reseal it. If LED continues to flash, replace card.
	Fast-flashing yellow (on 1/2 second; then off 1/2 second)	Environmental range exceeded.	Check for out-of-bounds environmental condition and correct it.
Port Speed (upper LED adjacent to each port)	No light (LED is off)	Port is either set to 1 Gb/sec mode, or it does not have incoming power.	Verify that the power LED is on. Use <code>portcfgspeed</code> command to change mode.
	Steady green	Port is set to 2 Gbit/sec mode.	No action required.

**Table 6: 16-Port Card LED Patterns (Continued)**

LED Location/ Purpose	Color	Status	Recommended Action
Port Status (lower LED adjacent to each port)	No light (LED is off)	Port is not receiving power, or there is no light or signal carrier detected.	Verify that the power LED is on, check the transceiver and cable.
		Polling is in progress.	Allow 60 seconds for polling to complete.
		Connected device is configured in an offline state.	Verify the status of the connected device.
	Steady green	Port is online (connected to an external device) but receiving no traffic.	No action required.
	Slow-flashing green (on 1 second; then off 1 second)	Port is online but segmented, indicating a loopback plug or cable or an incompatible switch.	Verify that the correct device is attached to the SAN Director 2/128.
	Fast-flashing green (on 1/4 second; then off 1/4 second)	Port is in internal loopback (diagnostic).	No action required.
	Flickering green	Port is online, with traffic flowing through port.	No action required.
	Steady orange	Port is receiving light or signal carrier, but it is not online yet.	No action required.
	Slow-flashing orange (on 2 seconds; then off 2 seconds)	Port is disabled due to diagnostic tests or <code>portdisable</code> command.	Reset port from workstation.
	Fast-flashing orange (on 1/2 second; then off 1/2 second)	Transceiver or port is faulty.	Change transceiver or reset switch from workstation.
	Alternating green/orange	Port is bypassed.	Reset port from workstation.

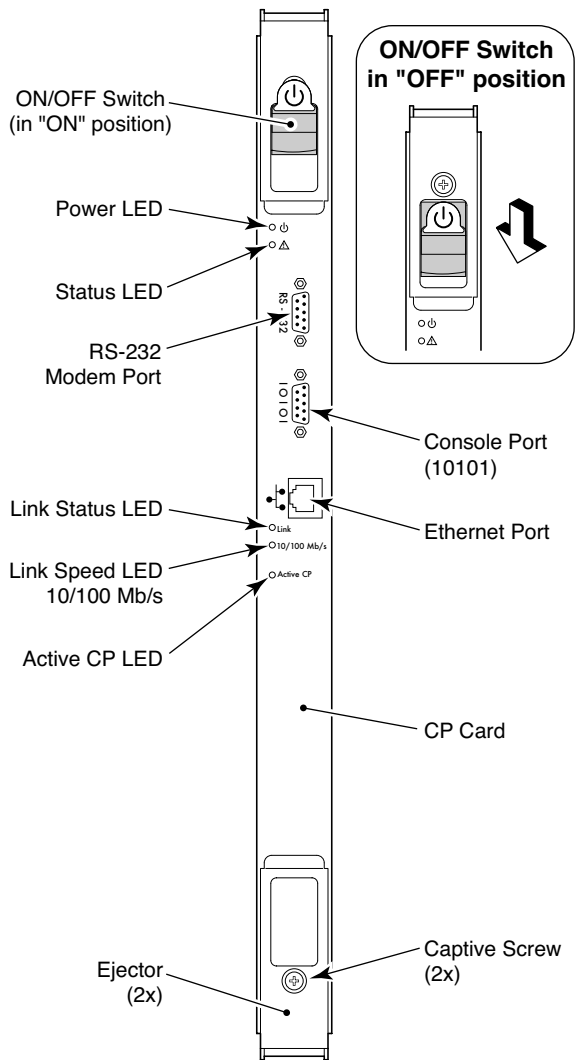
## CP Cards

To determine the status of a CP card:

1. Check the LED indicators on the port card (see [Figure 16](#)). The LED patterns may temporarily change during POST and other diagnostic tests; for information about how to interpret the LED patterns, refer to [Table 7](#).
2. Check port card status using the `slotshow` command (see “[Obtaining Chassis and Component Status](#)” on page 99 for an example) and `hashow` command.





For additional information about these commands, refer to the *HP StorageWorks Fabric OS 4.2.x Reference Manual*.



**Figure 16: Front of CP card**

**Table 7: CP Card LED Patterns**

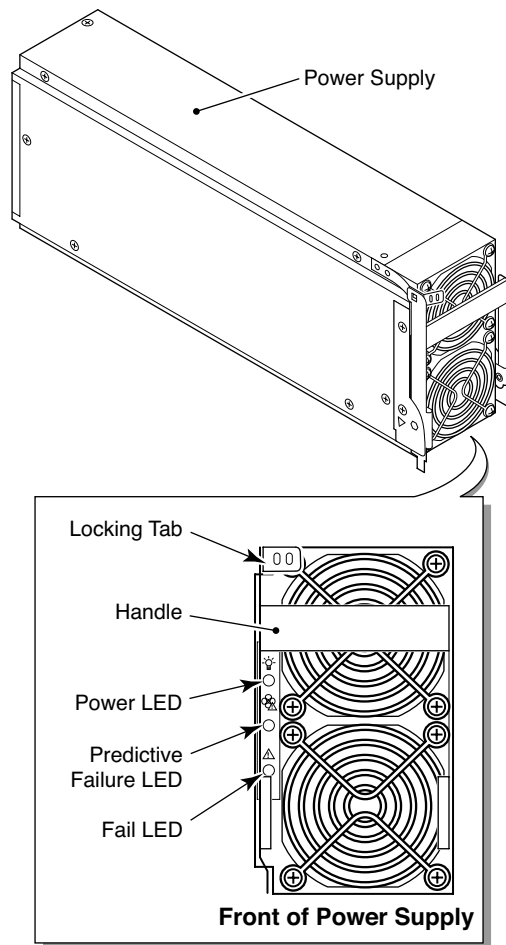
LED Location/ Purpose	Color	Status	Recommended Action
Power 	Steady green	CP card is not receiving power.	No action required.
	No light (LED is off)	CP card is not receiving power.	Ensure card is firmly seated and has power.
Status 	No light (LED is off)	CP card is either healthy or does not have power.	Verify that the power LED is on.
	Steady yellow	CP card is faulty or the switch is still booting.	Ensure card is firmly seated and switch has completed booting. If LED remains yellow, consult switch supplier.
	Slow-flashing yellow (on 2 seconds; then off 2 seconds)	CP card is not seated correctly or is faulty.	Pull card out and reseal it. If LED continues to flash, replace card.
	Fast-flashing yellow (on 1/2 second; then off 1/2 second)	Environmental range exceeded.	Check for out-of-bounds environmental condition and correct it.
Ethernet Link Status (upper LED beneath Ethernet port)	No light (LED is off)	Either an Ethernet link is not detected, or it does not have incoming power.	Ensure the card has power, Ethernet cable is firmly seated, and connected device is functioning.
	Flickering green/yellow	Ethernet link is healthy and traffic is flowing through port.	No action required.
Ethernet Link Speed (lower LED beneath Ethernet port)	No light (LED is off)	Ethernet link speed is 10 Mb/s or CP card does not have incoming power.	Ensure CP has power. <b>Note:</b> To force a persistent Ethernet link speed, use the <code>ifmode set</code> command.
	Steady green	Ethernet link speed is 100 Mb/s.	No action required.
Active CP (beneath Ethernet Link Status and Speed LEDs)	Steady blue	Active CP card.	No action required.
	No light (LED is off)	Standby CP card.	No action required.

## Power Supplies

To determine the status of a power supply:




1. Check the LED indicators on the power supply (see [Figure 17](#)). The LED patterns may temporarily change during POST and other diagnostic tests; for information about how to interpret the LED patterns, refer to [Table 8](#).
2. Check power supply status using the `psshow` command (see “[Obtaining Chassis and Component Status](#)” on page 99 for an example).

The power supply status displays OK, Absent, or Faulty. If a power supply is absent or faulty, contact the switch supplier to order replacement parts, as necessary.



**Figure 17: Power supply LEDs**

**Table 8: Power Supply LED Patterns**

LED Location/ Purpose	Color	Status	Recommended Action
Power 	No light (LED is off)	Power supply is not receiving power and is not providing power to the SAN Director 2/128.	Ensure power supply is firmly seated, SAN Director 2/128 is receiving power, both power cables are connected, and AC power switches are on.
	Steady green	Power supply is receiving power and is providing power to the SAN Director 2/128.	No action required.
Predictive Failure 	No light (LED is off)	Power supply is either healthy or is not receiving power.	Check the power LED.
	Flashing orange	Power supply is about to fail due to a failing fan inside the power supply.	Replace power supply.
Failure 	No light (LED is off)	Power supply is either healthy or is not receiving power.	Check the power LED.
	Steady orange	Either the SAN Director 2/128 has power but this power supply does not (AC switch may be off) or the power supply has failed.	Verify that the correct AC power switch is on and power supply is seated. If orange light continues, replace power supply.
	Flashing orange	Power supply is unable to supply power.	Verify that the incoming power meets power requirements (refer to <a href="#">"Technical Specifications" on page 163</a> ).

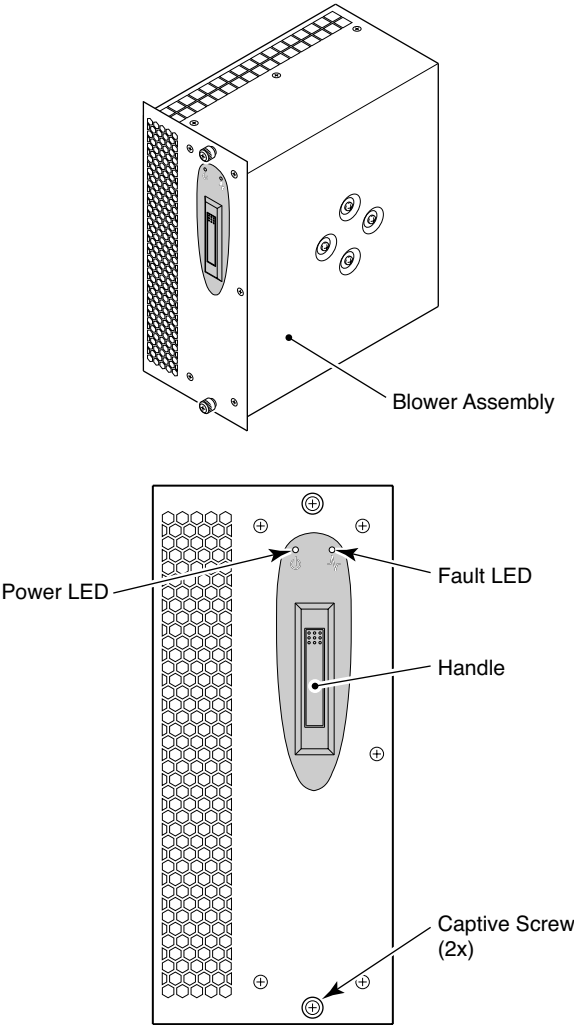
## Blower Assemblies

To determine the status of a blower assembly:

1. Check the LED indicators on the blower assembly (see [Figure 18](#)). The LED patterns may temporarily change during POST and other diagnostic tests; for information about how to interpret the LED patterns, refer to [Table 9](#).
2. Check the blower assembly status using the `fanshow` command.



The status for each blower assembly displays OK, Absent, or Faulty. The RPM of each fan in the assembly is also provided. If a blower assembly is absent or faulty, contact the switch supplier to order replacement parts, as necessary.

For additional information about these status indicators, refer to the *HP StorageWorks Fabric OS 4.2.x Reference Manual*.



**Figure 18: Blower assembly LEDs**

**Table 9: Blower Assembly LED Patterns**

LED Location/ Purpose	Color	Status	Recommended Action
Power 	No light (LED is off)	Blower assembly does not have incoming power.	Ensure that the blower assembly is firmly seated and has power.
	Steady green	Blower assembly has incoming power.	No action required.
Fault 	No light (LED is off)	Blower assembly is either healthy or does not have incoming power.	Ensure that the blower assembly has incoming power.
	Steady orange	Blower assembly has a failure (full or partial).	Replace blower assembly.
	Slow-flashing orange (on 2 seconds; then off 2 seconds)	Blower assembly is not seated correctly or is faulty.	Pull unit out and reseal. If LED continues to flash, replace unit.
	Fast-flashing orange (on 1/2 second; then off 1/2 second)	Environmental range exceeded.	Check for out-of-bounds environmental condition, resolve any problems, and reseal unit. If LED continues to flash, replace unit.



# WWN Card

To determine the status of the WWN card:

1. Check the LED indicators on the WWN bezel (see [Figure 19](#)) and verify that they reflect the actual status of the components.

The WWN bezel covers the WWN card and allows its LEDs to shine through. The LEDs on the WWN bezel provide a consolidated view of the port card status, CP card status, and power supply status. The LED patterns may temporarily change during POST and other diagnostic tests; for information about how to interpret the LED patterns, refer to [Table 10](#).

2. Check the WWN card status using the commands listed in [Table 10](#). Difficulty retrieving or modifying this data could indicate a WWN card failure.

**Table 10: Data Stored on the WWN Card**

Data	Related Commands
WWN values	<code>wwn</code> , <code>chassisshow</code>
Data about the chassis and WWN card	<code>chassisshow</code>
Ethernet and fibre channel IP address information for the CP cards	<code>ipaddrshow</code> , <code>ipaddrset</code>
History log information	<code>historyshow</code> , <code>historylastshow</code>
Names of switch	<code>switchname</code>

**Note:** For additional information about these commands, refer to the *HP StorageWorks Fabric OS 4.2.x Command Reference Guide*.

3. If the error log or serial console display error messages that indicate problems with WWN units (see [Table 11](#)), the WWN card might have failed.

WWN units correspond to information specific to the WWN card and are displayed by the **chassisshow** command. For additional information about this command, refer to the *HP StorageWorks Fabric OS 4.2.x Command Reference Guide*.

**Table 11: Messages That Can Indicate WWN Card Failure**

Type of Message	Sample Error Message
WWN unit fails its FRU (field replaceable unit) header access.	0x24c (fabos): Switch: <i>switchname</i> , error EM-I2C_TIMEOUT, 2, WWN 1 I2C timed out: state 0x4
WWN unit is being faulted.	0x24c (fabos): Switch: <i>switchname</i> , Critical EM-WWN_UNKNOWN, 1, Unknown WWN #2 is being faulted
WWN unit is not present or is not accessible.	0x24c (fabos): Switch: <i>switchname</i> , Error EM-WWN_ABSENT, 2, WWN #1 not present
Writing to the FRU history log ( <i>hilSetFruHistory</i> ) has failed.	0x24c (fabos): Switch: <i>switchname</i> , Error EM-HIL_FAIL, 2, HIL Error: <i>hilSetFruHistory</i> failed, rc=-3 for SLOT 3

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**Note:** For more information about error messages, refer to the *HP StorageWorks Diagnostic and System Error Messages 4.2.x Reference Manual*.

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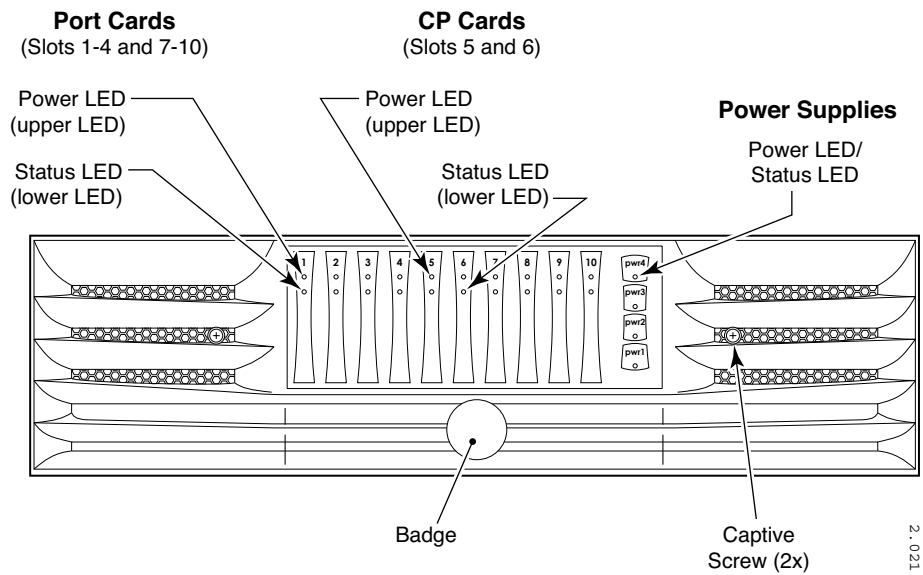


Figure 19: WWN bezel LEDs

Table 12: WWN Bezel LED Patterns

LED Location/Purpose	Color	Status	Recommended Action
16-Port card/CP card Power	Steady green	Power is OK.	No action required.
16-Port card/CP card Status	Steady amber	Card is faulty.	Check card.
	No light (LED is OFF)	Card is OK.	No action required.
<b>Note:</b> If a card slot or power supply bay has a filler panel installed, the corresponding LEDs on the WWN card do not light up.			
Power supply Power/Status	Steady green	Power is OK.	No action required.
	Steady amber	Power supply is faulty.	Check power supply.

**Note:** If a Status LED on the WWN bezel flashes, the Power LED on the WWN bezel also flashes, for increased visibility.

## Diagnostics and Troubleshooting Overview

For information about troubleshooting the entire fabric, refer to the *HP StorageWorks Fabric OS 4.2.x Procedures User Guide*.

The SAN Director 2/128 includes a number of diagnostic aids to assist with troubleshooting, including LEDs on the hardware, commands that display current status, diagnostic tests for hardware and software, and error messages. In addition, a number of optional management tools are available, such as Fabric Manager, Fabric Watch, and Advanced Performance Monitoring.

If the SAN Director 2/128 does not operate as expected, the following steps can be taken to diagnose the problem:

- Check the LEDs and refer to the LED tables (see [“Interpreting LED Activity”](#) on page 82) for recommended actions.
- Review the results of the last POST run by the SAN Director 2/128 (see [“Interpreting POST and Boot Results”](#) on page 100).
- Review the error logs (refer to the *HP StorageWorks Diagnostic and System Error Messages 4.2.x Reference Guide* for more information).
- Enter the `sensorshow` command to determine the status of the hardware components.
- Run diagnostic tests (see [“Diagnostics”](#) on page 102).
- Reboot the switch or power the entire chassis off/on.

If the problem is still unresolved after these steps, contact your support provider. The information required by your support provider in order to provide assistance is listed under [“Getting Help”](#) on page 14.

# Obtaining Chassis and Component Status

The CLI commands listed in [Table 13](#) provide status and environmental information about the chassis and its components. These commands provide information only, and they do not interrupt traffic flow. For more information about these commands, refer to the *HP StorageWorks Fabric OS 4.2.x Command Reference Guide*.

**Note:** The environmental commands report internal temperatures within the chassis. The 16-port cards can withstand internal temperatures of up to 75°C and the CP cards can continue to operate up to 80°C. However, the ambient temperature outside the chassis must be 40°C or less.

**Table 13: Environmental Status and Maintenance Commands**

Command	Information Displayed
sensorshow	Temperature readings for the port cards
	Temperature readings for the CP cards
	Status and RPM of all operational fans
	Status of all operational power supplies
tempshow	Temperature readings for the port cards
	Temperature readings for the CP cards
psshow	Status of all operational power supplies
fanshow	Status and RPM of all operational fans
chassisshow	Serial number, time awake, and additional information about each component
slotshow	Slot occupancy
errshow	Switch error log (lists status of any marginal/failed components)

**Note:** Enter CLI commands with all lowercase characters.

## Interpreting POST and Boot Results

The SAN Director 2/128 performs power on self test (POST) by default each time the chassis is powered on or the SAN Director 2/128 is rebooted or reset. The SAN Director 2/128 can be rebooted using the `switchreboot`, `reboot`, or `fastboot` commands. The `fastboot` command reboots the switches without running POST. If the active CP card is rebooted, it fails over to the standby CP card.

### POST

Each time the switch is powered on or reset, the switch automatically performs POST, a system check during which LED patterns might vary.

To verify that POST has completed without error:

- Verify that all LEDs return to a normal state after POST completes (see [“Interpreting LED Activity”](#) on page 82).

If one or more LEDs do not return to a normal state, and this is not due to the switch being set to beacon, refer to the relevant LED table to identify and correct the problem. For port cards and CP cards, the `slotshow` command can be used to check the status of the slots. For information about turning beaconing on/off, refer to the *HP StorageWorks Fabric OS 4.2.x Procedures User Guide*.

- Verify that the switch prompt displays when POST completes.

If it does not display, POST was not successfully completed. Contact the switch supplier for support.

- Review the system log.

Any errors detected during POST are written to the system log, which is accessible through the `errshow` command. For information about error messages, refer to the *HP StorageWorks Diagnostic and System Error Messages 4.2.x Reference Manual*.

POST includes the following steps:

- Preliminary POST diagnostics are run.
- Operating system is initialized.
- Hardware is initialized.

- Diagnostic tests are run on several functions, including circuitry, port functionality, ability to send and receive frames, all aspects of memory, parity, statistics counters, and serialization.

## Boot

Boot completes in a minimum of three minutes if POST is run. In addition to POST, boot includes the following steps after POST is complete:

- Universal port configuration is performed.
- Links are initialized.
- Fabric is analyzed. If any ports are connected to other switches, the switch participates in a fabric configuration.
- The switch obtains a domain ID and assigns port addresses.
- Unicast routing tables are constructed.
- Normal port operation is enabled.

## Diagnostics

Diagnostic tests are automatically run during POST to check the status of the switch. Any error messages generated during POST are sent to the error logs and to the serial console, if connected.

Diagnostic tests can also be run manually to test and troubleshoot the hardware and the firmware, including internal connections and circuitry, transceivers, and port cables. However, diagnostic tests are generally intended for use by support personnel.

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**Note:** Diagnostic error messages do not necessarily indicate that the switch requires maintenance.

---

Each diagnostic test can be implemented by entering the related command through a telnet or serial session. For a list of diagnostic tests and commands, refer to the *Fabric OS Procedures Guide*.

All diagnostic tests are run at link speeds of both 1 and 2 Gb/sec. They might temporarily lock the transmit and receive speeds to a specific speed. Some diagnostic tests require interconnecting the ports to each other or using loopback plugs. If ports are interconnected, the media (cables and transceivers) at each end of the connection must be of the same type. For example, short wavelength media must be connected to short wavelength media, and likewise with long wavelength media and copper media.

For more information about diagnostic tests and how to run them, refer to the *HP StorageWorks Fabric OS 4.2.x Procedures User Guide*.



## Troubleshooting the SAN Director 2/128

Table 14 provides a list of issues, possible causes, and recommended actions.

**Table 14: Troubleshooting the SAN Director 2/128**

Issue	Possible Cause	Recommended Action
Entire chassis powers off automatically.	Power supplies are inadequate to support the installed components.	Add an additional power supply.
Several or all components are not operating.	One or both power cables may not be connected to a live source.	Ensure that both power cables are connected to live outlets.
	One or both AC power switches might be off.	Ensure that both AC power switches are on (AC switches light up green when on).
Serial connection is faulty or serial port logs have incorrect or missing information.	Serial cable is not connected correctly.	Ensure that the cable is firmly connected to workstation computer and to the SAN Director 2/128.
	Terminal emulator application parameters are not set correctly.	Ensure that the terminal emulator application is configured as follows: 9600 bits per second, 8 databits, no parity, 1 stop bit, no flow control.
	Serial port might be incompatible (only RS-232 is supported).	Ensure that the SAN Director 2/128 is connected to an RS-232 port. RS-423 serial ports might experience difficulties due to corner-case incompatibilities of the standards.
	Pins on the serial cable or serial port might be damaged.	Remove the cable and inspect the pins on the cable and in the serial port. Do not reinstall if the pins on either component have any visible damage, as this could damage the pins on the other component. Replace components as required.

**Table 14: Troubleshooting the SAN Director 2/128 (Continued)**

Issue	Possible Cause	Recommended Action
Modems are not detected by switch.	Modems were connected after the SAN Director 2/128 was powered on.	Reboot the CP card(s) to which the modem(s) are connected.
	Modems are connected to the wrong ports on the CP cards.	Ensure that the modem cables are connected to the ports labeled "RS232" (the serial ports intended for terminal use are labeled 10101).
	Modems are not correctly configured.	Verify that the modems are configured as specified in <a href="#">"Setting Up and Installing Modems"</a> on page 153.
	Pins on the modem cable or modem port might be damaged.	Remove the cable and inspect the pins on the cable and in the port. Do not reinstall if the pins on either component have any visible damage, as this could damage the pins on the other component. Replace components as required.
Ethernet link speed is different than expected or a link cannot be established.	There might be a conflict with the Ethernet link speed negotiation set up by the network.	Specify the Ethernet link speed by entering the <i>ifmodeset</i> command.
Configuration data is inaccurate or cannot be accessed.	Chassis was powered off/on while the WWN card was uninstalled or failed.	Install an operational WWN card and power the system off/on again.
	The switch was rebooted while the WWN card was uninstalled or failed.	
Initial setup results in IP address/Domain ID conflict.	The switch was connected to the fabric before being configured.	Refer to <a href="#">"Initial Configuration Parameters"</a> on page 67 and the <i>HP StorageWorks Fabric OS 4.2.s Procedures User Guide</i> for configuration information.

**Table 14: Troubleshooting the SAN Director 2/128 (Continued)**

Issue	Possible Cause	Recommended Action
LEDs on one or more components are changing rapidly or do not indicate a healthy state.	The SAN Director 2/128 might be booting or running POST.	Verify that boot and POST are complete. The SAN Director 2/128 requires a minimum of 3 minutes, usually, after power-on to complete POST.
	Beaconing might be on for the entire SAN Director 2/128 or for individual components.	Determine whether beaconing is on by entering the <code>switchshow</code> command and determine whether switch beaconing or blade beaconing are on.
	Individual components might have failed.	Refer to the LED tables in <a href="#">“Interpreting LED Activity”</a> on page 82 for recommended actions.
	Pins on the components might be damaged.	Remove component from chassis and inspect pins on component and inside chassis. Do not reinstall if pins on either component are visibly damaged, as this could damage pins on other component. Replace parts as required.
None of the LEDs on an individual component are on.	Component might not be seated correctly.	Ensure that the SAN Director 2/128 has power and component is firmly seated. If problem continues, run the <code>sensorshow</code> command to determine component status. If component is a CP card or port card, enter the <code>slotshow</code> command to determine status.
	Component might have failed.	Replace component as necessary.
CP cards are failing over frequently.	A third-party application has a memory leak.	Check application for memory leaks.
	There is excessive serial port activity.	Ensure that serial port activity remains below specified amount.
	CP card is attached to an ethernet with high traffic loads.	Ensure that ethernet traffic remains below specified amount
	Chassis is overheated.	Enter <code>sensorshow</code> command to check internal temperature. If components are overheating, shut down port cards as necessary to return the temperature to operating range.

**Table 14: Troubleshooting the SAN Director 2/128 (Continued)**

Issue	Possible Cause	Recommended Action
One or more 16-port cards have either shut down or failed POST as indicated by the error log.	16-port cards might be overheated.	Enter the <code>sensorshow</code> command to check the internal temperature readings. If components are overheating, shut down port cards as necessary to return the temperature readings to the operating ranges.
	16-port card might be faulty.	Enter the <code>slotshow</code> command to determine status. For more information, enter the <code>diagdisablepost</code> command; then, the <code>slotpoweron [slot number]</code> command. Resolve the source of the problem or replace the card as required.
	Pins on the card or on the backplane (inside the slot) might be damaged.	Remove card from chassis and inspect pins on card and on backplane inside slot. Do not reinstall if pins on either component are visibly damaged, as this could damage pins on other component. Replace components as required.
An individual component is not operating as expected.	Component may not have power or may not be firmly seated.	Ensure component is receiving power (power LED should be on) and component is firmly seated.
	Pins on the component or the backplane might be damaged.	Remove component from chassis and inspect pins on card and inside chassis. Do not reinstall if pins on either component are visibly damaged, as this could damage pins on other component. Replace parts as required.
	The component might have failed.	Enter the <code>sensorshow</code> command to determine component status. If component is a CP card or port card, enter the <code>slotshow</code> command to determine status. Replace component as necessary

# Installing SAN Director 2/128 FRUs

## 4

The FRUs in the SAN Director 2/128 Director can all be removed and replaced without special tools. Replacement instructions are provided with each replacement unit ordered. The SAN Director 2/128 can continue operating during many of the FRU replacements if the conditions specified in the procedure are followed.

This chapter provides the following information:

- [Replacing the Chassis Door](#), page 108
- [Replacing the Cable Management Tray](#), page 110
- [Replacing the Cable Guides \(Pillars\)](#), page 112
- [Replacing a 16-Port Card and Filler Panel](#), page 113
- [Replacing a CP Card](#), page 123
- [Replacing a Power Supply and Filler Panel](#), page 137
- [Replacing a Blower Assembly](#), page 140
- [Replacing the WWN Bezel and Card](#), page 143

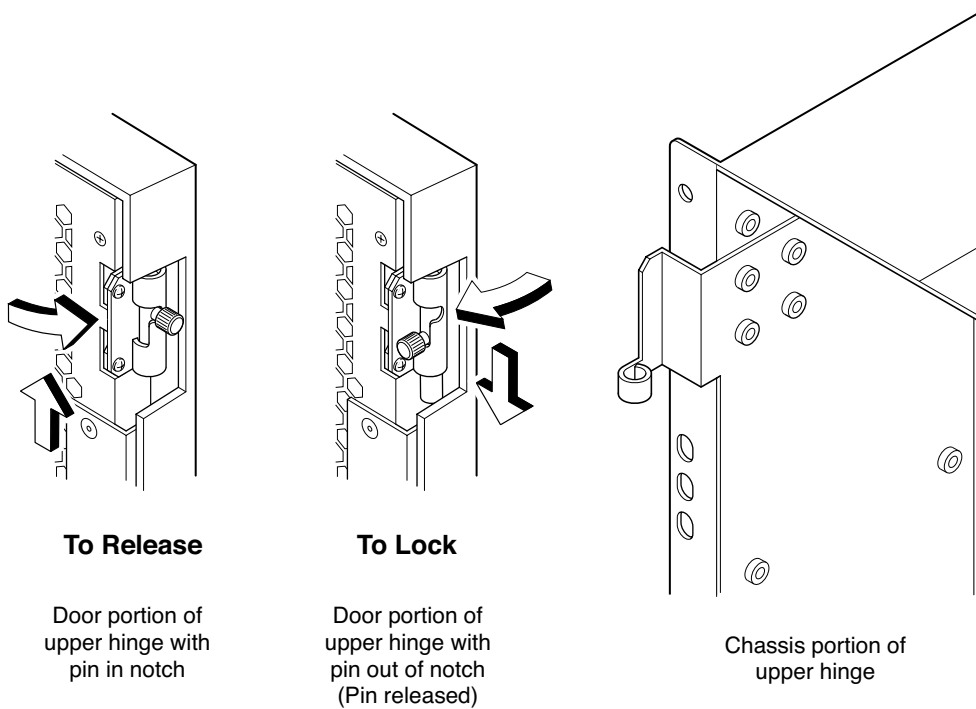
## Replacing the Chassis Door

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**Note:** The chassis door is required to ensure the SAN Director 2/128 meets EMI and other regulatory certifications.

---

1. Remove the chassis door from the SAN Director 2/128:
  - a. Open the door to an angle of approximately 90 degrees.
  - b. Support the door to prevent it from falling. Push the spring-loaded pin on the upper hinge up and into the notch in the hinge (see [Figure 20](#)), and push the spring-loaded pin on the lower hinge down and into the notch. Pull the door away from the chassis.
2. Install the new door in the chassis:
  - a. Verify that the levers on the spring-loaded pins on both hinges are pushed into the notches.
  - b. Align the spring-loaded pins with the chassis portion of the hinges.
  - c. Release the pins by pushing the levers out of the notches.



**Figure 20: Upper door hinge**

## Replacing the Cable Management Tray

Use these steps to replace the cable management tray. The procedure requires a #2 Philips screwdriver. The SAN Director 2/128 can continue to operate during the installation.

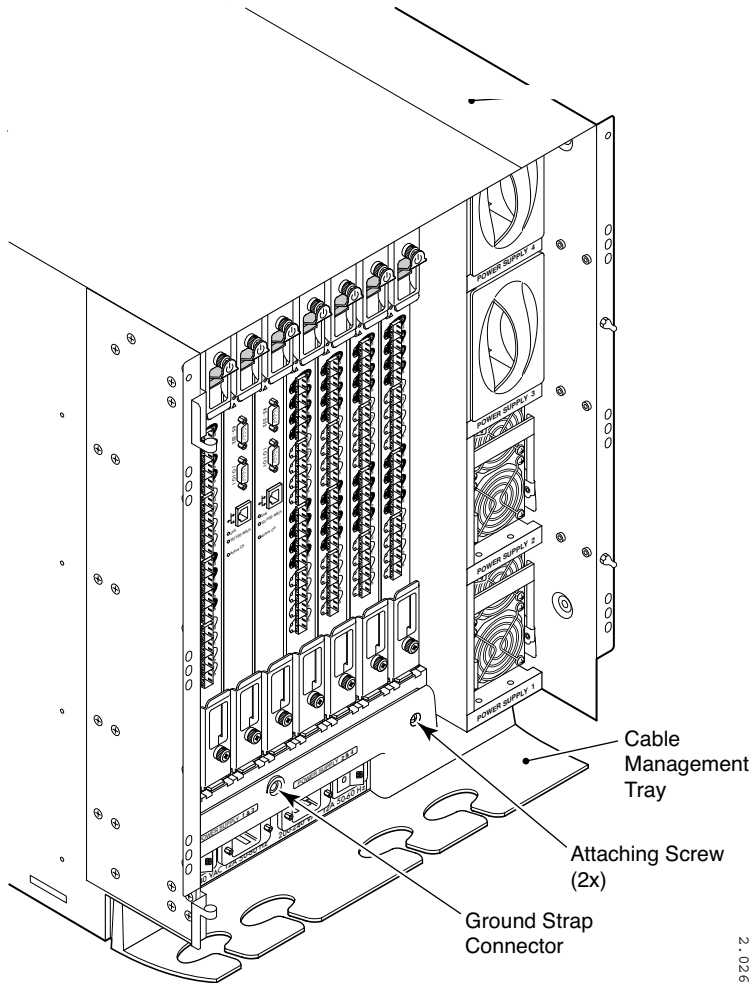
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**Note:** Do not use a power screwdriver on the cable management tray.

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1. Remove the existing cable management tray:
  - a. Move the cables carefully out of the tray.
  - b. Unscrew the two screws holding the tray to the chassis and save for reuse (see [Figure 21](#) for location of screws).
  - c. Rotate the front of the tray down; then, lift the back to disengage the tabs on the back from the chassis.
2. Install the new cable management tray:
  - a. Orient tray as displayed in [Figure 21](#) and insert the two tabs beneath the tray into the two slots at the bottom of the AC panel; then, rotate the front of the tray upward until it locks into place.
  - b. Position and tighten the two attaching screws.
  - c. Arrange the cables through or along the tray, as required.





**Figure 21: Cable management tray**

## Replacing the Cable Guides (Pillars)

The cable guides (pillars) can be used to organize the port cables into logical groups, such as port quads (sets of four neighboring ports). The cable pillars do not attach to the chassis.

The cable pillars also serve to keep the cables evenly spaced and hold them away from the 16-port card, to prevent the cables from bending to less than the minimum bend radius.



**Caution:** Do not route the cables in front of the air exhaust vent, which is located at the top of the port side of the chassis. Arrange the cables so that the minimum bend radius is not exceeded; for a 50-micron cable, the minimum bend radius is 2 inches under full tensile load and 1.2 inches with no tensile load. Tie wraps are not recommended for optical cables because they are easily overtightened and can break the optical cables.

---

To use the cable pillars, orient them horizontally and insert the cables into the holes, using a separate hole for each cable (see “[Managing Cables](#)” on page 63).

## Replacing a 16-Port Card and Filler Panel

This section describes how to remove and replace 16-port cards (see [Figure 22](#)) and 16-port card filler panels (see [Figure 23](#)) from the SAN Director 2/128.

### Preliminary Steps

The following steps should be taken before removing and replacing a 16-port card:

1. Check the LEDs.

The LEDs are located on the front panel of each 16-port card (see [Figure 15](#)). Refer to “[16-Port Cards](#)” on page 82 for a description of the 16-port card LEDs.

---

**Note:** The WWN bezel on the nonport side of the SAN Director 2/128 also displays a power and status LED for each 16-port card.

---

2. Establish a telnet or console session.

Before replacing a 16-port card, establish a telnet or console connection to determine a failure and verify operation after replacement. Refer to the *HP StorageWorks Fabric OS 4.2.x Procedures User Guide* for information about how to check the status of hardware components using the CLI.

3. Check the cable slack.

Make sure there is plenty of cable slack to remove a 16-port card without any optical, power, or Ethernet cable obstructions. Refer to “[Managing Cables](#)” on page 63 for cabling guidelines.

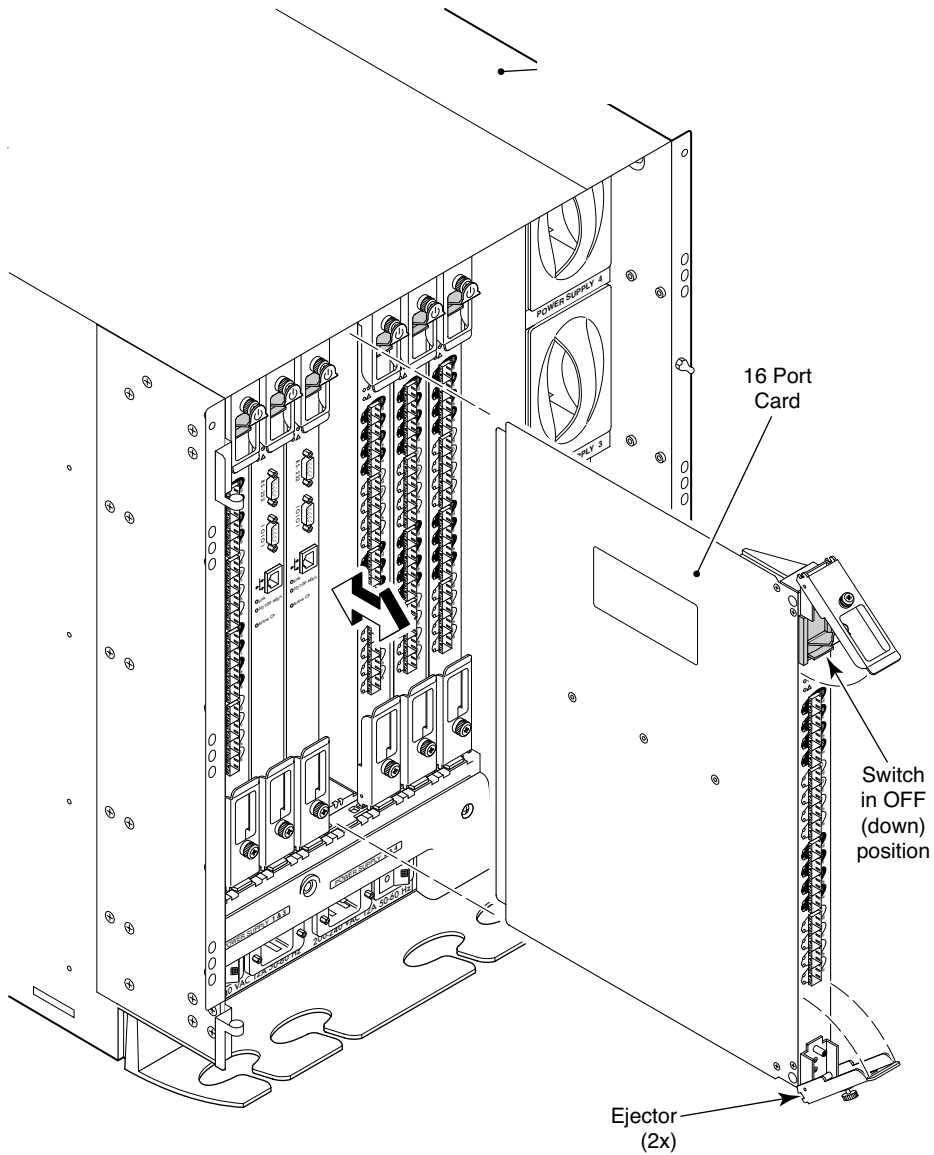
4. Ensure that you have a valid spare part.

Make sure that the part numbers match for the unit being replaced. The **chassisShow** command displays information about the 16-port cards, including part numbers (xx-000xxx-xx), manufacturer serial numbers, and additional status. The part number of each 16-port card is also printed on a sticker on the front panel of the card.

## Installing a 16-Port Card

Use the steps in the following sections to replace a 16-port card. The procedure requires:

- An ESD (electrostatic discharge) grounding strap
- Workstation computer
- Replacement port card or filler panel
- SFP transceivers (as needed)
- SFP cables (as needed)



**Figure 22: 16-port card removal and replacement**

## Removing the Existing 16-Port Card

A failed 16-port card can be identified by inspecting its LEDs and by using CLI commands to verify status. Refer to “[16-Port Cards](#)” on page 82 for a description of the LEDs.



**Caution:** Wear a grounded ESD strap when handling a 16-port card. The chassis has a grounding connection above the power connectors. Hold the 16-port card by the edges of the metal pan. Do not use the ejectors to hold or carry a 16-port card.

Disassembling any part of a 16-port card or filler panel voids the part warranty and regulatory certifications. There are no user-serviceable parts inside the 16-port card or filler panel

---

**Note:** Before removing any cables from the faulty 16-port card make a note of cable order by referring a cable to the physical port; this reduces confusion during recabling. If multiple 16-port cards are being replaced, replace one card at a time. Before replacing a 16-port card, determine if it is the entire card or the SFPs that are faulty.

---

To remove a 16-port card, follow these steps:

1. Ensure that traffic is not flowing through the 16-port card (port LEDs should be off) prior to disconnecting cables.
2. Disconnect any cables and SFP transceivers from the 16-port card.
3. Turn the 16-port card off by sliding the ON/OFF switch in the top handle down.

---

**Note:** You can also send hot-swap notification from the CLI using the commands `slotpoweroff` and `slotpoweron`.

---

4. Wait for the Power LED to turn off in response to the hot-swap request before uninstalling the 16-port card.
5. Unscrew the captive screws from both handles.
6. Lever both ejectors open to approximately 45 degrees, and pull the 16-port card out of the chassis.

---

**Note:** If you inadvertently relatch the ejectors prior to the 16-port card being removed, wait at least one second prior to unlatching the ejectors again.

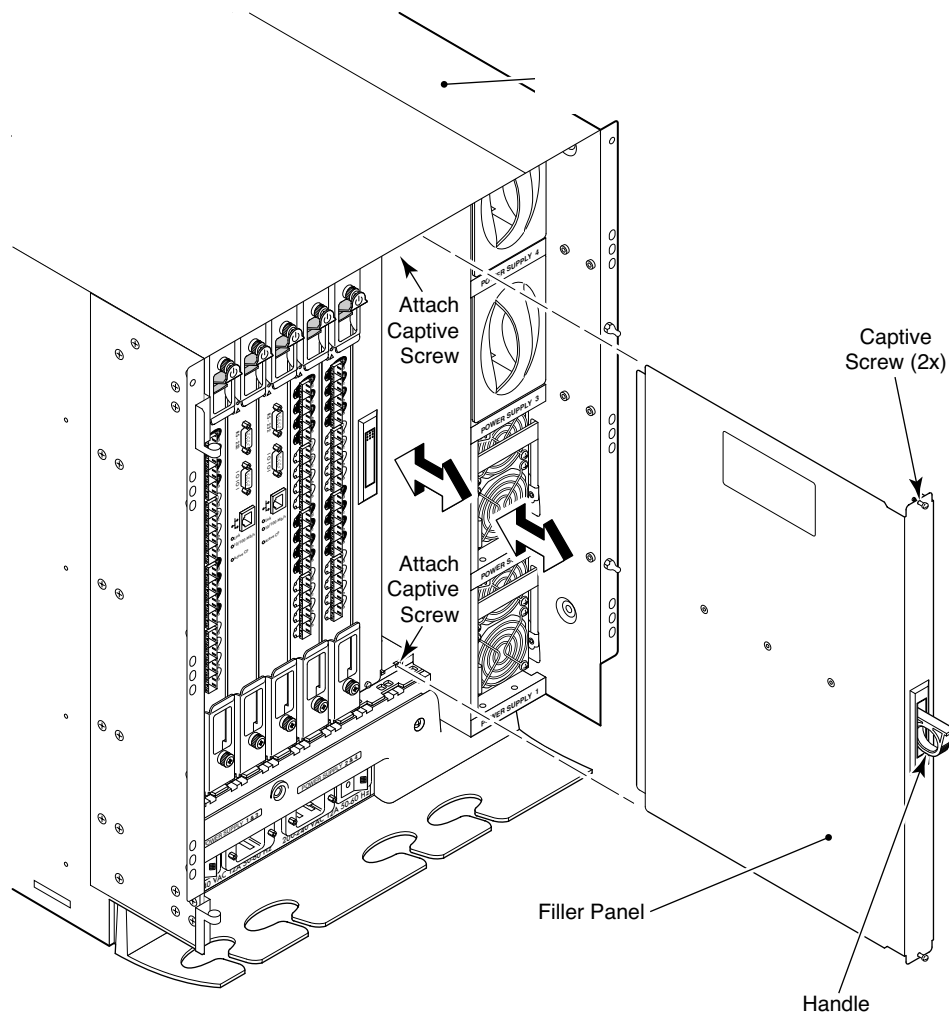
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7. If the card is not being replaced by another 16-port card, install a filler panel to ensure correct cooling of the chassis and protection from dust.

## Removing a Filler Panel

To remove a filler panel, follow these steps (see [Figure 23](#)):

1. Remove the two captive screws.
2. Grasp the handle in the middle of the faceplate.
3. Slide the filler panel out of the chassis.



**Figure 23: Removing and replacing a filler panel**



## Installing a 16-Port Card

A 16-port card can be installed in any combination of slots 1—4 and 7—10. The control processor (CP) cards occupy slots 5—6. Any slots that are not occupied by a 16-port card (or CP card) should have a filler panel installed to ensure correct cooling of the chassis and protection from dust.

---

**Note:** Do not force the installation. If the 16-port card or filler panel does not slide in easily, ensure that it is correctly aligned inside the rail guides before continuing. Installing a 16-port card or filler panel with incorrect alignment damages both the chassis and the replacement part.

Wear a grounded ESD strap when handling a 16-port card. The chassis has a grounding connection above the power connectors.

Hold the 16-port card by the edges of the metal pan. Do not use the ejectors to hold or carry a 16-port card.

Disassembling any part of a 16-port card or filler panel voids the part warranty and regulatory certifications. There are no user-serviceable parts inside the 16-port card or filler panel.

---

To install the new 16-port card, follow these steps:

1. Orient the 16-port card so that the ejectors are at the front of the chassis and the flat side of the card is on the left.
2. Open the ejectors to approximately 45 degrees, align the flat side of the 16-port card inside the upper and lower rail guides in the slot (see [Figure 24](#)), and slide the 16-port card into the slot, with slight pressure to the left, until it is firmly seated.
3. Close the ejectors by pushing the black handles toward the center of the port card until the ejectors lock. The levering action of the handles seats the 16-port card in the slot.
4. Verify that the Power LED on the 16-port card is displaying a steady green light (it can take a few seconds to turn on). If it does not turn on, ensure that the 16-port card has power and is firmly seated.

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**Note:** The LED patterns may temporarily change during POST and other diagnostic tests.

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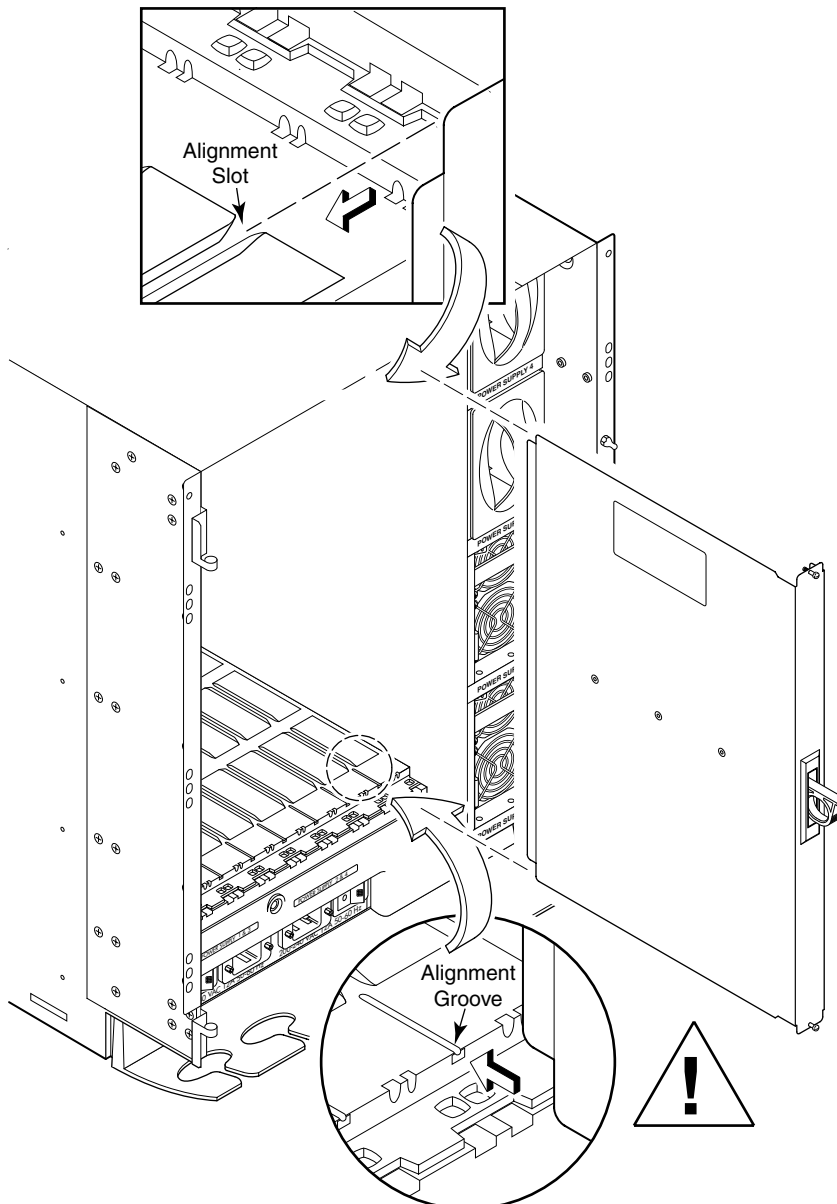
5. Install SFP transceivers and cables in the 16-port card, as required.
6. Group and route the cables as desired.



**Caution:** Do not route the cables in front of the air exhaust vent (located at the top of the port side of the chassis).

---

7. Verify the installation. For information about how to check the status of hardware components using the CLI, refer to the *HP StorageWorks Fabric OS 4.2.x Procedures User Guide*.



**Figure 24: Card guides inside each card slot**

## Install a Filler Panel

1. Align the flat side of the filler panel inside the upper and lower rail guides in the slot (see [Figure 24](#)); then, slide the filler panel into the slot (with slight pressure to the left) until it is firmly seated.
2. Tighten the two captive screws.

## Replacing a CP Card

This section describes how to remove and replace a control processor (CP) card from the SAN Director 2/128. Each SAN Director 2/128 has two CP cards: one located in slot 5 and the other in slot 6.

The SAN Director 2/128 can continue to operate while one CP card is replaced if the other CP card continues to operate and no failover occurs (you can prevent failover by entering the `hadisable` command). The active CP card is determined by the most recent failover.

The configuration on the active CP card is automatically mirrored to the standby CP card; this section includes steps to ensure that the new CP card boots up as the standby CP card.

The new CP card automatically assumes the IP address and host name assigned to the slot.

If the new CP card does not have the same firmware as the active CP card, it must be upgraded or downgraded to the same firmware version.

---

**Note:** Disassembling any part of a CP card voids the part warranty and regulatory certifications. There are no user-serviceable parts inside a CP card. To ensure adequate system pressure for cooling purposes, leave the faulty CP card in the slot until you are ready to perform the replacement procedure.

---



**Caution:** Disassembling any part of a CP card voids the part warranty and regulatory certifications. There are no user-serviceable parts inside a CP card. To ensure adequate system pressure for cooling purposes, leave the faulty CP card in the slot until you are ready to perform the replacement procedure.

---



**Caution:** Use the same version of Fabric OS on both CP cards. Using different versions can cause malfunctioning. If the replacement CP card has a different version, update cards to the same firmware version.

---

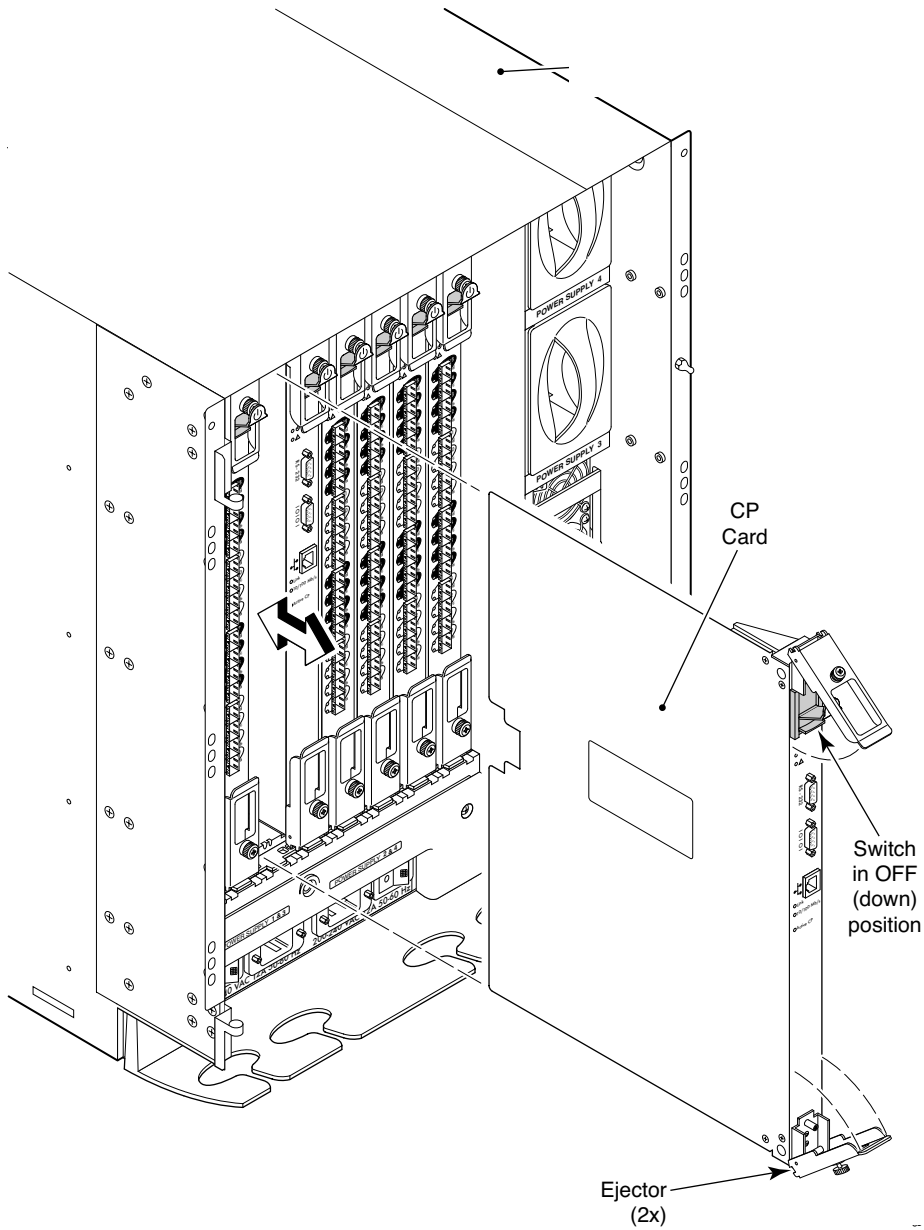


**WARNING:** Do not attempt to replace the battery on a CP card. There is danger of explosion if the battery is incorrectly replaced or discarded. Contact the switch supplier if the real-time clock begins to lose time.

---

Use the steps in the following sections to replace a CP card. Locate the following items prior to installation:

- ESD grounding strap
- Workstation computer
- Serial cable provided with the SAN Director 2/128
- IP address of an FTP server for backing up the SAN Director 2/128 configuration



**Figure 25: CP card removal and replacement**

## Identifying a Failed CP Card

The following indicators confirm that a CP card needs to be replaced:

- The Status LED on the CP card is yellow, or the Power LED is not ON.
- The `slotshow` command does not show that the CP card is enabled.
- The CP card does not respond to telnet commands, or the serial console is not available.
- The `hashow` command indicates that the CP cards have not achieved redundancy (after 30 minutes).
- The calendar clock is inaccurate, or the CP card does not boot up or shut down normally.
- Any of the following messages display in the error log:
  - `Slot unknown` message relating to a CP slot
  - CP card errors or I<sup>2</sup>C time-outs
  - `FRU: FRU_FAULTY` messages for a CP card
  - Configuration loader messages or `Sys PCI config` messages
  - Generic system driver messages `FABSYS`
  - Platform system driver messages `Platform`
  - EM messages that indicate a problem with a CP card
  - Function fail messages for the CP master

## Recording Critical Switch Information

Back up the switch configuration before replacing a CP card.

To record critical switch information, follow these steps:

1. Create a serial connection to the healthy CP card:
  - a. Disable any serial communication programs running on the workstation (such as synchronization programs).
  - b. Connect a serial cable to the terminal serial port (10101 Console Port).
  - c. Connect the other end of the serial cable to a serial port on the workstation. If necessary, the adapter on the serial cable can be removed to allow for a serial RJ45 connection.



- d. Open the terminal emulator application and configure as follows:
    - Bits per second: 9600
    - Databits: 8
    - Parity: None
    - Stop bits: 1
    - Flow control: None
  - e. When the terminal emulator application stops reporting information, press **Enter**.
2. Log in to the healthy CP card as admin. The default password is “password”.

```
Fabric OS (swDir)
swDir login: admin
Password:
swDir:admin>
```

3. Check the Active LED on the CP cards (see [Figure 16](#)) to determine which one is active.
4. Enter the hashow command to confirm the active CP card.

```
swDir:admin> haShow
Local CP (Slot 5, CP0): Active
Remote CP (Slot 6, CP1): Standby
HA Enabled, Heartbeat Up, State Synchronized
swDir:admin>
```

---

**Note:** Enter all remaining commands from the serial console for the active CP card, unless otherwise indicated. For more information about commands, refer to the *HP StorageWorks Fabric OS 4.2.x Command Reference Guide*.

---

5. If the healthy CP card is also the active CP card, continue with step 6; otherwise, fail over the cards as described here:
  - a. Create a serial connection to the faulty CP card.
  - b. Log in to the serial console as admin.
  - c. Enter the hafailover command. The healthy CP card becomes the active CP card.

- d. Wait until the Status LED on the healthy CP card is no longer on (indicates failover is complete).
- e. Enter the `hashow` command from the serial console for the healthy CP card (the new active CP card) to verify the failover.

```
Fabric OS (swDir)
swDir login: admin
Password:
swDir:admin>hashow
Local CP (Slot 5, CP0): Active
Remote CP (Slot 6, CP1): Standby
HA Enabled, Heartbeat Up, State Synchronized
swDir:admin>

swDir:admin> hafailover
Forcing Failover...
swDir:admin>

swDir:admin> hashow
Local CP (Slot 5, CP0): Standby
Remote CP (Slot 6, CP1): Active
HA Enabled, Heartbeat Up, State Synchronized
swDir:admin>
```

6. Enter the `version` command to record the version of the active CP card.
7. Enter the `hadisable` command from the active CP card to prevent failover or communication between the CP cards during the replacement.
8. From the serial console for the healthy (and active) CP card, back up the current configuration:
  - a. Enter the `configupload` command.

---

**Note:** The `configupload` command uploads the switch configuration to a specified FTP server.

---

- b. Enter the requested information at the prompts.

```
swDir:admin> configupload
Server Name or IP Address [host]: 123.456.78.90
User Name [None]: user
File Name [config.txt]: config.txt
Password:
upload complete
swDir:admin>
```

9. Log in to the SAN Director 2/128 and back up the current configuration:
  - a. From the serial console for the healthy CP card, enter the login command.
  - b. Log in as admin.
  - c. Enter the configupload command.
  - d. Enter the requested information at the prompts.

## Removing a CP Card

The SAN Director 2/128 continues to operate while a CP card is being replaced if the redundant CP card continues to operate and a failover does not occur (you can prevent failover by entering the `hadisable` command).

---

**Note:** The core section within the SAN Director 2/128 CP cards provide internal routing bandwidth that are always active on both CP cards. Removing a CP card might impact user performance, and should not occur until the replacement CP card is ready to be installed.

To ensure adequate system pressure for cooling purposes, leave the faulty CP card in the slot until you are ready to perform the replacement procedure.

---

To remove a CP card (see [Figure 25](#)), follow these steps:

1. Disconnect all cables (modem, serial, Ethernet) from the faulty CP card.



**Caution:** Wear a grounded ESD strap when handling a CP card. A grounding connection is available on the chassis above the power connectors.

To allow the current configuration to be copied to the new CP card, a new CP card must be installed while the other CP card is still operating.

---

2. Turn the CP card off by sliding the ON/OFF switch in the top handle down (see [Figure 25](#)).
  3. Wait for the Power LED to turn off in response to the hot-swap request before uninstalling the CP card.
- 



**Caution:** Do not remove the CP card until the Power LED is off. Also, hold CP cards by the edges of the metal pans, not by the ejector handle

---

4. Unscrew the captive screw from both handles.
  5. Lever both ejector handles open simultaneously to approximately 45 degrees and pull the CP card out of the chassis.
- 



**WARNING:** Do not attempt to replace the battery on a CP card. There is danger of explosion if the battery is incorrectly replaced or discarded. Contact the switch supplier if the real-time clock begins to lose time.

---

## Installing a CP Card

To install a new CP card in the slot, follow these steps:

1. Open the ejector handles to approximately 45 degrees; then, orient the CP card so that the handles are towards you and the flat metal side is on the left.
2. Align the flat metal side of the CP card inside the lower and upper card guides in the slot as shown in [Figure 25](#); then, slide the CP card into the slot until it is firmly seated.
3. Close the ejectors by pressing the handles in toward the CP card.
4. Tighten the captive screws.
5. Slide the CP card ON/OFF switch in the upper handle up (covering the captive screw).

6. Verify that the Power LED is green (might require a few seconds). If not, ensure that the CP card has power, is firmly seated, and the ejectors are in the locked position.
7. Connect the modem, serial, and Ethernet cables as required to the new CP card.



**Caution:** Do not route the cables in front of the air exhaust vent (located at the top of the port side of the chassis).

---

## Verifying Operation of the New CP Card

1. Verify that boot and POST are complete on the new CP card (a minimum of 3 minutes) and that the CP cards have achieved failover redundancy:
  - a. Wait until the Status LEDs on both CP cards are off.

---

**Note:** The Status LED on the active CP card displays yellow until the active CP card is fully operational, and the Status LED on the standby CP card displays yellow until the CP cards have achieved failover redundancy.

---

- b. Enable the redundancy feature by entering the `haenable` command from the serial console for the active CP card
  - c. From the serial console for the active CP card (which should still be the CP card that was not replaced), enter the `hashow` command and verify that the command output includes “HA Enabled, Heartbeat Up, State Synchronized”.

```
swDir:admin> hashow
Local CP (Slot 5, CP0): Active
Remote CP (Slot 6, CP1): Standby
HA Enabled, Heartbeat Up, State Synchronized
swDir:admin>
```

---

**Note:** If the command output does not include “HA Enabled, Heartbeat Up, State Synchronized”, POST is not complete or the CP cards have not yet achieved redundancy. Wait a minute or two and reenter the command, until you can verify that redundancy has been achieved.

---

2. Enter the `slotshow` command. The command output should show the new CP card as “enabled”.

```
swDir:admin> slotShow
Slot   Blade Type   ID      Status
-----
      1      SW BLADE    4  FAULTY
      2      SW BLADE    4  DISABLED
      3      SW BLADE    4  ENABLED
      4      SW BLADE    4  DIAG RUNNING POST2
      5      CP BLADE    5  ENABLED
      6      CP BLADE    5  ENABLED
      7      UNKNOWN          VACANT
      8      SW BLADE    4  DIAG RUNNING POST1
      9      SW BLADE    4  INSERTED, NOT POWERED ON
     10      UNKNOWN          VACANT
swDir:admin>
```

3. Determine the firmware version (enter the `firmwareshow` command).

```
swDir:admin> firmwareshow
Primary partition:      v4.2.0meteor_pit_02_031204_0722
Secondary Partition:    v4.2.0meteor_pit_02_031204_0722
swDir:admin>
```

4. If the firmware version of the replacement card does not match that of the active CP card, bring the replacement card to the same firmware level as the active card. Check with the switch supplier for supported versions.

Download the firmware, using either of the following command options:

- `firmwaredownload` to download the firmware to both CP cards at the same time. Enter all requested information and choose the **reboot** option.
- `firmwaredownload -s` to download the firmware to only one of the CP cards. Enter all requested information and choose the **reboot** option.

```
SW0:admin> firmwaredownload
Server Name or IP Address: 123.456.78.90
User Name: user
File Name: /v4.2.0/release.plist
Password: xxxxxx
Full Install (Otherwise upgrade only) [Y]:
Do Auto-Commit after Reboot [Y]:
Reboot system after download [N]: y
Start to install packages.....
dir #####
terminfo #####
<some output not shown>
glibc #####
sin #####
Write kernel image into flash.
file verification SUCCEEDED
Firmwaredownload completes successfully.
SW0:admin>
```

For more information about the `firmwaredownload` command, refer to the *HP StorageWorks Fabric OS 4.2.x Command Reference Guide*.

5. Verify that the reboot is complete and the CP cards have achieved failover redundancy:
  - a. Wait until the Status LEDs on both CP cards are off.
  - b. Enter the `hashow` command and verify that the command output includes “HA Enabled, Heartbeat Up, State Synchronized”; If not, wait a minute and reenter the command, until you have verified that redundancy is achieved.
6. Enter the `version` or `firmwareshow` command to verify that the firmware version has been updated.

7. Create a serial connection to the new CP card:
  - a. Disable any serial communication programs running on the workstation (such as synchronization programs).
  - b. Connect a serial cable to the terminal serial port (10101 Console Port).
  - c. Connect the other end of that serial cable to a serial port on the workstation.

---

**Note:** If necessary, remove the adapter on the serial cable to allow for a serial RJ45 connection.

---

- d. Open the terminal emulator application and configure as follows:
    - Bits per second: 9600
    - Databits: 8
    - Parity: None
    - Stop bits: 1
    - Flow control: None
8. Log in to the new CP card as admin.

```
Fabric OS (swDir)
swDir login: admin
Password:
swDir:admin>
```

9. From the serial console for the new CP card, enter the `hafailover` command to fail the active CP card over to the new CP card.
10. Verify that the configuration has successfully propagated to the new CP card by checking any configuration parameters for which you have specified nondefault values. To do this, enter the `configshow` command followed by a text string (in quotes) that relates to the parameter: for example, `configshow fabric`. This limits the command output to entries that contain that text string.



---

**Note:** Entering the `configshow` command *without* a filter prints out approximately 1000 lines. For more information about this command, refer to the *HP StorageWorks Fabric OS 4.2.x Command Reference Guide*.

---

```
swDir:admin> configshow "fabric"
fabric.domain:2
fabric.ficonmode:0
fabric.ididmode:0
fabric.ops.BBCredit:16
fabric.ops.E_D_TOV:2000
fabric.ops.R_A_TOV:10000
fabric.ops.dataFieldSize:2112
fabric.ops.mode.fcpProbeDisable:0
fabric.ops.mode.isolate:0
fabric.ops.mode.longDistance:0
fabric.ops.mode.noClassF:0
fabric.ops.mode.pidFormat:1
fabric.ops.mode.tachyonCompat:0
fabric.ops.mode.unicastOnly:0
fabric.ops.mode.useCsCtl:0
fabric.ops.mode.vcEncode:0
<remaining output not shown>
swDir:admin>
```

11. If the SAN Director 2/128 configuration does not replicate correctly, download the backup configuration:
  - a. Enter the `switchdisable` command to disable the switch.
  - b. Enter the `configdownload` command and enter the requested information.

- c. After the configuration has been downloaded, enter the `switchenable` command.

```
swDir:admin> switchdisable

swDir:admin> configdownload
Server Name or IP Address [host]: 123.456.78.90
User Name [None]: user
File Name [config.txt]: config.txt
Password: xxxxxx
Committing configuration...done.
download complete
swDir:admin>

swDir:admin> switchenable
10 9 8 7 6 5 4 3 2 1
fabric: Principal switch
fabric: Domain 1
```

12. Package the faulty CP card in the packaging provided with the new CP card, and contact the switch supplier to determine the return procedure.

## Replacing a Power Supply and Filler Panel

Use this procedure to remove and replace a power supply. The SAN Director 2/128 can continue operating during the replacement if at least one power supply continues operating. A minimum of two power supplies are recommended.

---

**Note:** You do not need to notify the SAN Director 2/128 of a hot-swap request for a power supply. The power supply bays are isolated; power supply filler panels are not required to ensure correct air flow.

---

The left power connector provides power to the power supplies in slots #1 and #3, and the right power connector provides power to the power supplies in slots #2 and #4. The power connectors and the power supply slots are color-coded to identify which power connectors provide power to which power supply slots. See [Figure 1](#) for power supply location.



**Caution:** To protect against AC failure, a minimum of one power supply in slot #1 or slot #3 and one in slot #2 or #4 is recommended. If only two power supplies are installed and they are both installed in slots corresponding to the same power cable, unplugging a single power cable will power down the entire chassis.

If adequate power is abruptly lost such as through removal of a power supply, the entire switch is powered down; the power off order designated by the `powerOffListSet` command is not followed.

Disassembling any part of the power supply voids the part warranty and regulatory certifications. There are no user-serviceable parts inside the power supply.

---

## Replacing a Power Supply

Use these step to replace a power supply. No tools are required.

1. Determine whether power adequate to keep the chassis operating will be available throughout the replacement. If adequate power will *not* be consistently available, shut down the SAN Director 2/128 gracefully, as follows:
  - a. Open a telnet session to the active CP card and log in to the switch as admin.

- b. Enter the `switchshutdown` command.
  - c. Power off the chassis by flipping both AC power switches to the off position (the “0” on the AC switch).
2. Remove the current power supply from the chassis (see [Figure 26](#)).
  - a. Push the locking tab in toward the power supply; then, pull the handle out and down and use it to pull the power supply out of the chassis.
  - b. Support the power supply from underneath while removing it from the chassis.
3. Install the new power supply:

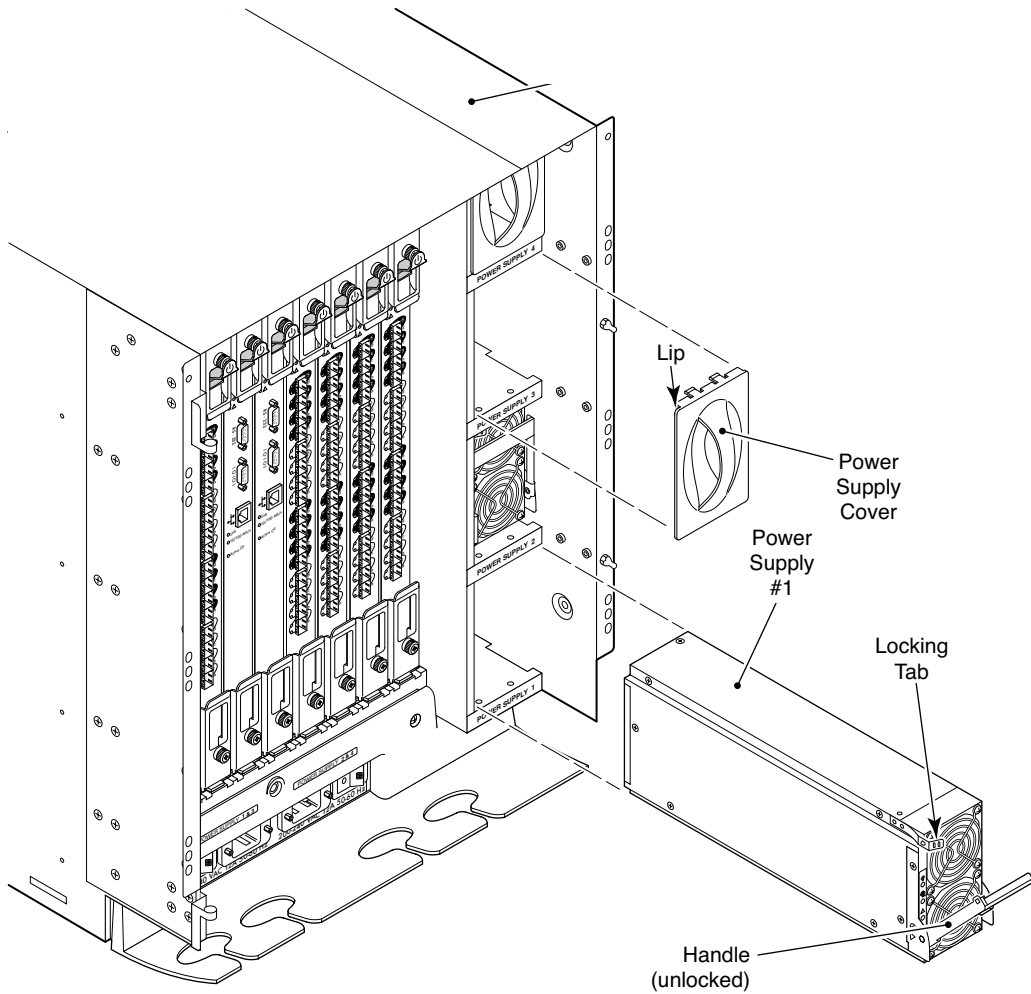


**Caution:** Do not force the installation of the power supply. If the part does not install easily, ensure that it is properly oriented.

---

- a. Orient the power supply so the handle is toward the front of the chassis and the LEDs are on the left, unlock the handle, and insert the power supply into the slot and push the handle up until it clicks.
  - b. Verify that the power supply is seated by pulling gently on the handle.
4. Verify the top LED on the power supply displays a steady green light. If it does not, ensure both power cables are plugged in and both AC switches are flipped to “1” (AC switch lights up green).
5. If the chassis was powered down, flip both AC power switches to “1”.

The AC power switches light up green when power is being supplied, and the SAN Director 2/128 performs POST by default.



**Figure 26: Power supply removal and replacement**

## Replacing a Blower Assembly

This procedure provides instructions for replacing a SAN Director 2/128 blower assembly. The SAN Director 2/128 requires a minimum of two operating blower assemblies at all times. To ensure continuous adequate cooling, maintain three operating blower assemblies at all times except for the brief period when replacing a blower assembly. The port cards automatically shut down if the internal temperature range is exceeded.



**Caution:** Disassembling any part of the blower assembly voids the part warranty and regulatory certifications. There are no user-serviceable parts inside the blower assembly.

---

Use these steps to replace a blower assembly. A #2 flathead screwdriver is required.

1. Before removing the blower assembly, verify the other two assemblies are functioning correctly. The blower assembly Power LED should be steady green and the Fault LEDs should not be lit (see [Figure 2](#) for LED locations).
2. Remove the blower assembly from the chassis:
  - a. Use the screwdriver to loosen the self-retaining screws at top and bottom of blower assembly.
  - b. Push in the top of the handle, pull out the lower part of the handle, and pull the blower out of the chassis.

---

**Note:** Support the blower assembly from underneath while removing it from the chassis.

---

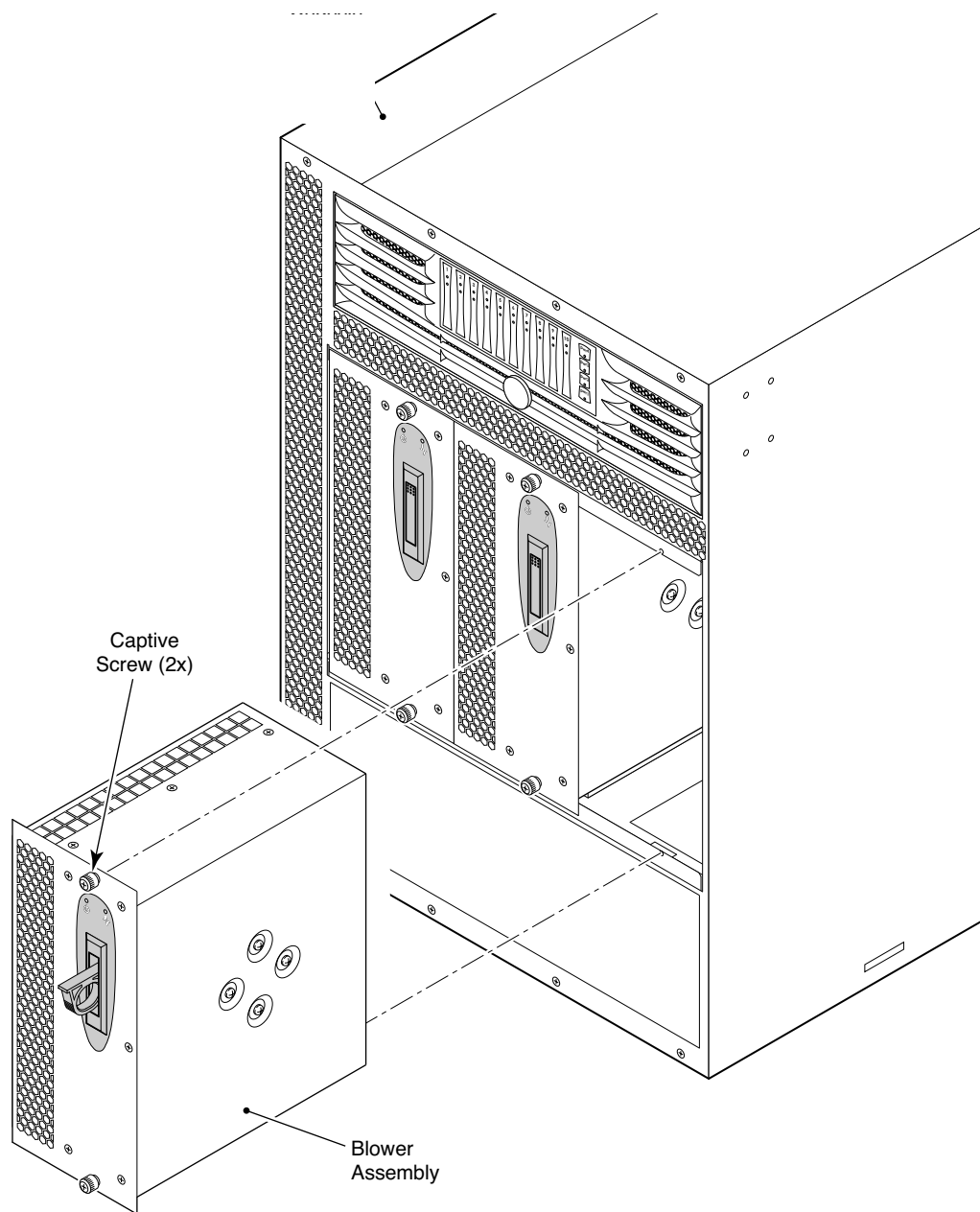
3. Install the new blower assembly in the chassis.
  - a. Orient the blower assembly as shown in [Figure 27](#) and slide it into the chassis, pushing firmly to ensure that it is seated.



**Caution:** Do not force the installation of the blower assembly. If the part does not install easily, ensure that it is properly oriented.

---

- b. Verify that the Power LED displays a green light; if not, ensure that the blower assembly is correctly seated.
- c. Push the top of the handle into the recess.
- d. Tighten the self-retaining screws to finger-tight.



**Figure 27: Blower assembly removal and replacement**



## Replacing the WWN Bezel and Card

The WWN card is located on the nonport side of the chassis underneath the WWN bezel (see [Figure 2](#) in this guide). The WWN card is highly reliable, containing fully redundant circuits; it does not usually require replacement under normal operating conditions.

If the WWN card does fail, the SAN Director 2/128 can continue operating until the new WWN card is installed if the configuration is not modified, no hardware components are replaced, and the SAN Director 2/128 is not rebooted.

Relacing the WWN card requires a telnet session to the SAN Director 2/128. The CLI can be either a telnet session or a serial console session; instructions are provided here for both.

## Identifying a Failed WWN Card

The following indicators confirm that a WWN card needs to be replaced.

---

**Note:** Check that the current card is firmly seated when performing the troubleshooting steps.

---

- Visible mechanical damage to the WWN card
- Any of the Status LEDs on the WWN card do not reflect the actual status of the components
- Problems viewing or modifying the data stored on the WWN card.
- Error messages regarding WWN units #1 or #2 (see [Table 16](#))

To verify the status of the WWN card:

1. Check the LED indicators on the WWN bezel (see [Figure 19](#)) and verify that they reflect the actual status of the components. The WWN bezel covers the WWN card and allows its LEDs to shine through. The LEDs on the WWN bezel provide a consolidated view of the 16-port card status, CP card status, and power supply status. For information about how to interpret the LED patterns, refer to [Table 15](#).

---

**Note:** The LED patterns might temporarily change during POST and other diagnostic tests.

---

2. Check the WWN card status using the commands listed in [Table 15](#). Difficulty retrieving or modifying this data could indicate a WWN card failure.

**Table 15: Data Stored on the WWN Card**

Data	Related Commands
WWN values	<code>wwn</code> , <code>chassisshow</code>
Data about the chassis and WWN card	<code>chassisshow</code>
Ethernet and fibre channel IP address information for the CP cards	<code>ipaddrshow</code> , <code>ipaddrset</code>
History log information	<code>historyshow</code> , <code>historylastshow</code>
Name of switch	<code>switchname</code>

3. If the error log or serial console display error messages that indicate problems with the WWN unit (see [Table 15](#)), the WWN card might have failed.

WWN units correspond to information specific to the WWN card and are displayed by the `chassisshow` command. For additional information about this command, refer to the *HP StorageWorks Fabric OS 4.2.x Command Reference Manual*.

**Table 16: Messages That Might Indicate a WWN Card Failure**

Type of Message	Sample Error Message
WWN unit fails its FRU (field replaceable unit) header access.	0x24c (fabos): Switch: <i>switchname</i> , error EM-I2C_TIMEOUT, 2, WWN I2C timed out: state 0x4
WWN unit is being faulted.	0x24c (fabos): Switch: <i>switchname</i> , Critical EM-WWN_UNKNOWN, 1, Unknown WWN is being faulted
WWN unit is not present or is not accessible.	0x24c (fabos): Switch: <i>switchname</i> , Error EM-WWN_ABSENT, 2, WWN not present
Writing to the FRU history log ( <code>hilSetFruHistory</code> ) has failed.	0x24c (fabos): Switch: <i>switchname</i> , Error EM-HIL_FAIL, 2, HIL Error: hilSetFruHistory failed, rc=-3 for SLOT 3

## Replacing a WWN Card

Use these steps to replace a WWN card. The following items are needed to replace the WWN card:

- ESD (electrostatic discharge) grounding strap
- If a serial console session is used, a serial cable and a workstation computer with a terminal emulator application (such as HyperTerminal for Windows systems or TIP for Solaris systems.)



**Caution:** *Do not* power cycle or reboot the SAN Director 2/128 or replace the CP cards or port cards until the WWN card is verified as functional or a replacement WWN card is installed. If any of these events happen while the WWN card is failed or uninstalled, the configuration information is lost, and it will be necessary to reconfigure the SAN Director 2/128 after installing the new WWN card.

Disassembling any part of the WWN card voids the part warranty and regulatory certifications. The WWN card contains no user-serviceable parts.

---

Figure 28 shows the nonport side of the SAN Director 2/128, which contains the WWN bezel and card.

## Replacing the WWN Card

This procedure requires a telnet session or a serial console session with the SAN Director 2/128.

If a serial console session is used, a serial cable and a workstation computer with a terminal emulator application (such as HyperTerminal for Windows systems or TIP for Solaris® systems) are required.



**Caution:** *Do not* power cycle or reboot the SAN Director 2/128 or replace the CP cards or port cards until the WWN card is verified as functional or a replacement WWN card is installed. If any of these events happen while the WWN card is failed or uninstalled, the configuration information is lost, and it will be necessary to reconfigure the SAN Director 2/128 after installing the new WWN card.

Disassembling any part of the WWN card voids the part warranty and regulatory certifications. The WWN card contains no user-serviceable parts.

---

1. Open a CLI session (telnet or serial) to the SAN Director 2/128 and log in as admin. The default password is “password”.

— To login by telnet

```
Fabric OS (swDir)
swDir login: admin
Password:
swDir:admin>
```

— To login by Serial Console

---

**Note:** If a serial console is used, all commands must be entered through the active CP card unless otherwise indicated. For command details, refer to the *HP StorageWorks Fabric OS 4.1.x Reference Manual*.

---

2. To log in by serial console, you must first determine which CP card is active. Check the “Active CP” LED or enter the `hashow` command through either a serial or telnet session and then connect to the active card.
  - a. Connect the serial cable to the active CP card.
  - b. Disable any serial communication programs running on the workstation (such as synchronization programs).
  - c. Insert one of the serial cables into the terminal serial port on the active CP card (the terminal serial port is the second serial port from the top of the CP card).

- d. Connect the other end of the serial cable to a serial port on the workstation. If necessary, remove the adapter on the serial cable to allow for a serial RJ45 connection.
- e. Open the terminal emulator application and configure as follows:
  - Bits per second: 9600
  - Databits: 8
  - Parity: None
  - Stop bits: 1
  - Flow control: None
- f. When the terminal emulator application stops reporting information, press **Enter** and log in as admin (the default password is “password”).

```
<Initial text printed on console not shown>
Fabric OS (swDir)
swDir login: admin
Password:
swDir:admin>
```

- g. Enter the hashow command to determine which CP card is active.

```
swDir:admin> hashow
Local CP (Slot 5, CP0): Active
Remote CP (Slot 6, CP1): Standby
HA Enabled, Heartbeat Up, State Synchronized
swDir:admin>
```

3. Enter frureplace wwn from the active CP card and wait for the phrase “Do you wish to continue [y/n]?” to display; then enter y.
4. Verify that the following has occurred:
  - a. The prompt, “Please enter the word ‘continue’...” displays in the CLI. Do *not* enter y to continue until the replacement WWN card is installed.

- b. All the LEDs on the WWN bezel turn off.

```
swDir>admin>frureplace wwn
This is the WWN card hot swap interface.
Continuing from this point will require the whole process to be
completed.
If this process is not complete due to system fails-over, or CP power
cycled, Please follow the recovery procedure in Core Switch WWN Card
Removal and Replacement document.

Do you wish to continue [yN]? y

Backing up WWN card data, please wait about 25 seconds for further
instruction.

Ready to restore WWN card data, please make sure you have a replacement
FRU now.

If this session lost due to user aborted, please reinitiate the invoking
command and follow the instructions to complete the operation.

Please enter the word `continue' when done: continue
Restoring the replacement FRU now, please wait about 20 seconds to
complete
Verifying the replacement FRU now...
WWN card hot swap is now complete.
FRU replacement completed successfully!
```

These events indicate that data has been backed up and the card can be replaced.

5. Unscrew both captive screws on the WWN bezel (see [Figure 28](#)); then, pull the bezel away from chassis and set it aside. The WWN card is visible.



**Caution:** To protect the WWN card components, wear an ESD grounding strap and prepare an antistatic bag or grounding pad on which to place the WWN card. Do not place anything on top of the card.

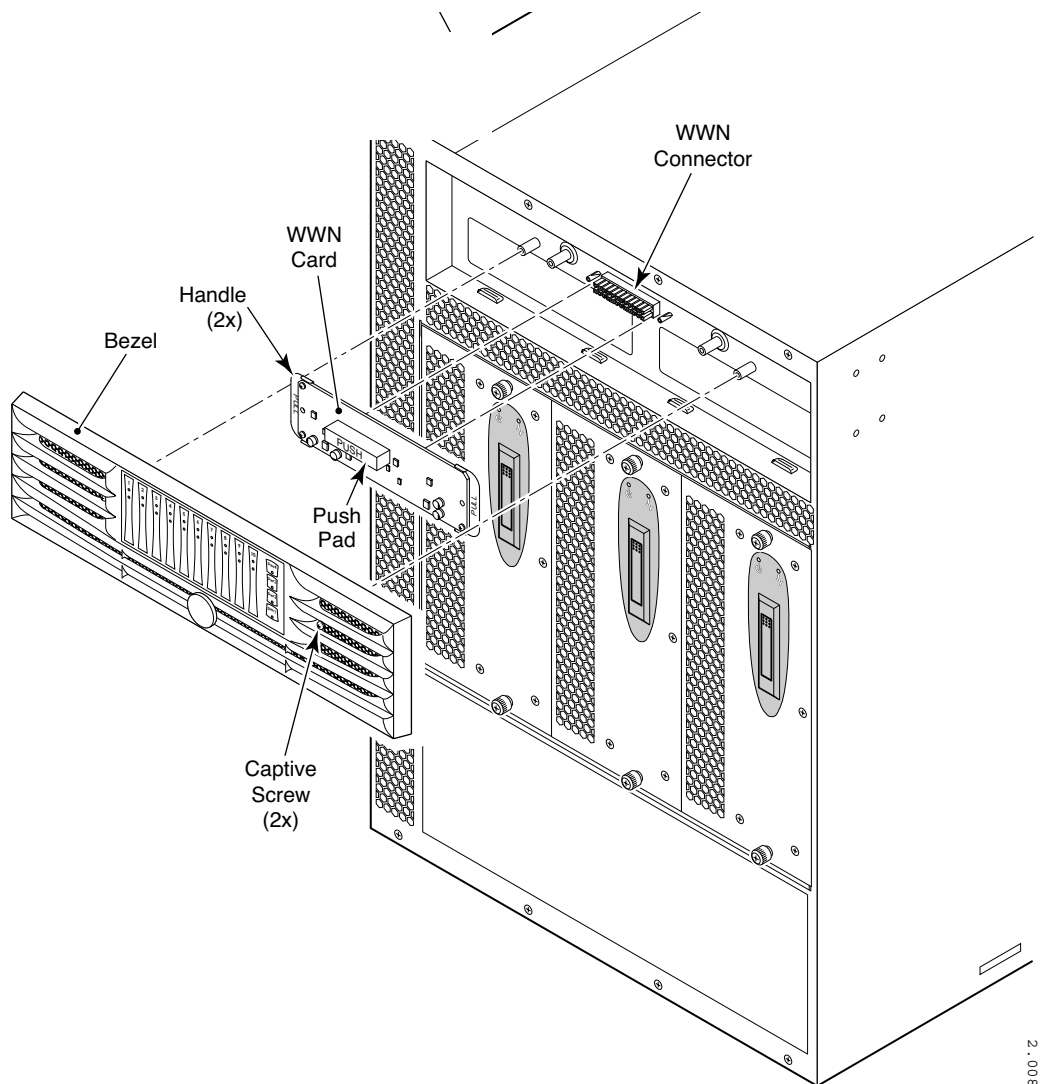
---

6. Use the handles (see [Figure 28](#)) to *gently* pull the card away from the chassis.
7. Set the WWN card on a static free surface, such as a grounding pad.

## Installing a WWN Card

Use these steps to install a new WWN card.

1. Unpack the new WWN card and save the packaging for returning the faulty WWN card.
2. Hold the card by the handles and orient with the LEDs at the top (see [Figure 28](#)); then, align the connector on the card with the connector on the chassis (the connectors are keyed to ensure correct installation) and use the “Push Pad” to press the card onto the connector *gently*, until it is fully seated.



**Figure 28: WWN Bezel and card removal and replacement**





**Caution:** Do not force the installation. If the part does not install easily, ensure that it is properly oriented.

---

## Replacing the WWN Bezel

Use these steps to reinstall the WWN bezel.

1. Orient the bezel on the chassis (see [Figure 28](#)); then, insert both retaining screws into the standoffs on the chassis and tighten to finger-tight.
2. In the CLI session, type **continue** to indicate that the replacement has been completed.

```
Please enter the word `continue' after the new WWN card has been
installed: continue
```

```
Restoring the information to the replacement FRU now, please wait about
20 seconds to complete
```

```
Verifying the replacement FRU now...
```

```
WWN card hot swap is now complete.
```

```
FRU replacement completed successfully!
```

3. Verify that the WWN card is correctly connected by checking the LEDs on the WWN card to see if they reflect the status of the components.

---

**Note:** The LEDs might take up to 2 minutes after WWN card installation to begin functioning.

---

4. Pack the faulty WWN card in the packaging provided with the new card and return it to the switch supplier.



# Setting Up and Installing Modems

## 5

This chapter provides the following information:

- [Using High Availability Connectivity](#), page 154
- [Connecting Modems](#), page 156
- [Setting Up a Remote Modem System](#), page 158
- [Verifying the Modem Connection](#), page 160

Each CP card in the SAN Director 2/128 contains a modem serial port for connection to a Hayes-compatible modem. The modem serial ports are wired as standard DTE ports and have the same commands, log in capabilities, and operational behavior as the terminal serial ports. However, asynchronous informational messages and other unsolicited text are not sent to the modem ports. No additional software is required to use modems with the SAN Director 2/128.



**Caution:** The SAN Director 2/128 detects modems only during power-on, reboot, or a CP card failover sequence. HP recommends setting up the modems before powering on the SAN Director 2/128.

For increased security, any active modem sessions are automatically disconnected if the modem cable is disconnected.

For optimal security, disconnect the modem cable when it is not in use.

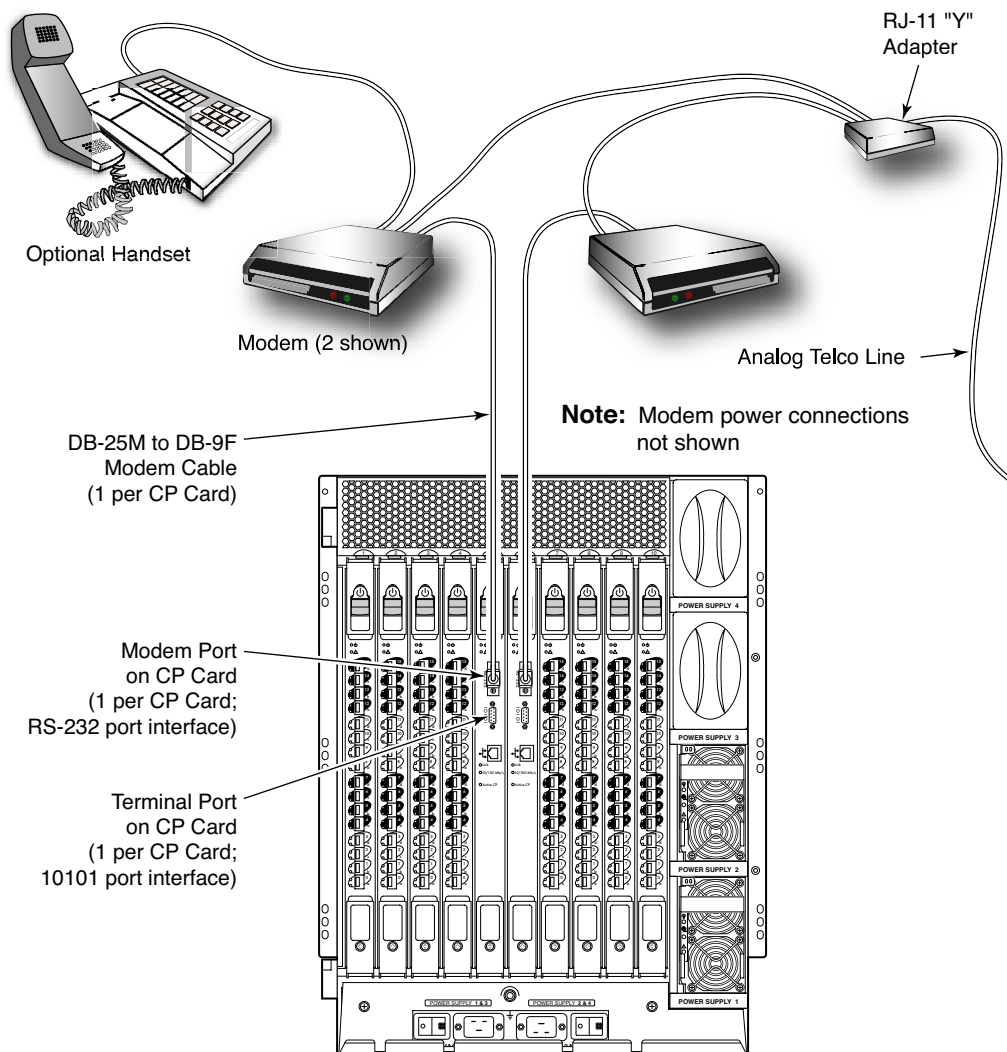
## Using High Availability Connectivity

High availability of the modem connection can be ensured by connecting a separate modem to each CP card and then connecting both modems to a shared telephone line (see [Figure 29](#)). This ensures an available telephone connection to the active CP card even if a failover occurs; however, it is necessary to log back in after a failover. When both CP cards are connected to a shared telephone line, callers are automatically dialed in to the active CP card, which answers on the first ring. If the active CP card cannot answer for any reason, the standby CP card answers on the seventh ring and allows login to proceed.

---

**Note:** If a modem connection is set up, connecting a modem to each CP card is recommended.

---



**Figure 29: Two modems attached for high availability**

## Connecting Modems

The following items are required to set up two modems to work with the SAN Director 2/128:

- Two Hayes-compatible modems, such as the Zoom/Modem V.92 EXT Model 3049
- Two standard modem cables, DB25 (male) to DB9 (female)
- One RJ-11 “Y” adapter for standard telco wiring or equivalent circuitry (three total connections)
- One analog telephone line

---

**Note:** Setting up the modems before powering on the SAN Director 2/128 and connecting it to the fabric is recommended.

---

To connect modems to the SAN Director 2/128:



**Caution:** Powering off the SAN Director 2/128 before connecting cables to the modem ports is recommended.

---

1. Power off the SAN Director 2/128.
2. Set up the two modem units and corresponding power connections, but do not power on the modems until all cables are attached.
3. Connect the modem cables to the modems and to the SAN Director 2/128 RS-232 modem ports.
4. Connect the telephone “line” inputs on the modems to the RJ-11 “Y” connector.
5. This effectively places both modems on a single telephone line.
6. Optionally connect a telephone handset to one of the “phone” connections on the modems.
7. Connect the “Y” adapter to an appropriate analog telephone line and document the dial-in number for later use.
8. Power on the modems and verify that the Modem Ready indicator illuminates on both units.

9. Power on the SAN Director 2/128, or reboot if it was not powered off during the previous steps.

This allows the SAN Director 2/128 to recognize the modems.

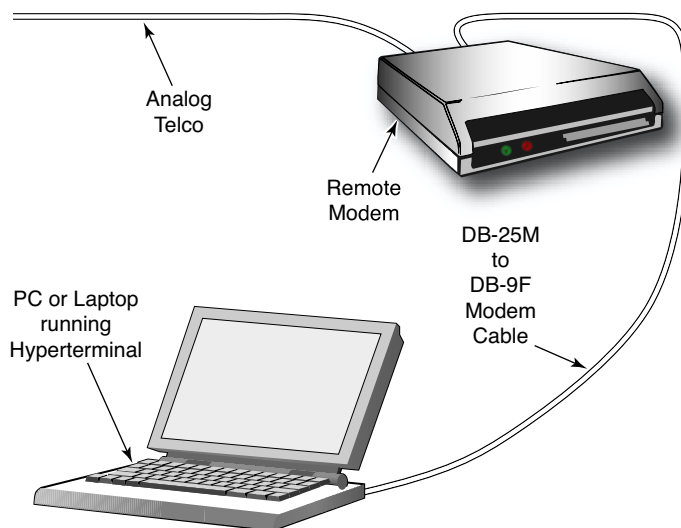
## Setting Up a Remote Modem System

After the modems are connected, you can use a telco system to dial in to the modems and verify that they answer and communicate as expected. If a dial-out modem facility is not available, you can use a terminal emulation program on a computer workstation (or laptop) that has an attached modem.

This procedure is only required if a dial-out modem facility is not already available for testing the SAN Director 2/128 modem connections.

To set up the optional remote modem:

1. Connect the remote modem to the workstation, as shown in [Figure 30](#).
2. Disable any serial communication programs running on the workstation (such as a synchronization program for a PDA).



**Figure 30: Remote modem setup**



3. Launch the terminal emulator application and configure as described below.

For most Windows systems	Parameter	Value
	Port speed (bits per second)	115200*
	Data protocol	Standard EC
	Compression	Enabled
	Flow control	Hardware
	Databits	8
	Parity	None
	Stop bits	1
	Modulation	Standard
*Port usually defaults to highest speed supported by modem; might negotiate for slower speed.		

4. Follow the instructions from the modem manufacturer to set up and verify modem operation.

## Verifying the Modem Connection

This section provides information about how to verify that the modems are correctly connected.

---

**Note:** This procedure requires either a telco system to dial in to the modems or a terminal emulation program on a laptop or workstation that has an attached modem. Refer to [“Setting Up a Remote Modem System”](#) on page 158 for instructions on setting up a remote modem with a terminal emulation program.

---

To verify the modem connection:

1. Check that both modem cables are firmly connected.
2. Power on the modems, if not already on.

---

**Note:** The modems must be powered on and operational before the SAN Director 2/128 is powered on, to allow the SAN Director 2/128 to detect the modems during boot.

---

3. Verify that both modems indicate they are ready by illuminating their “Clear to Send” (CS), “Terminal Ready” (TR), and “Modem Ready” (MR) indicators. If this does not occur, ensure that the modems are connected to a power source and are powered on, and check all modem cable connections.
4. Verify that POST is complete on the SAN Director 2/128 (a minimum of 3 minutes).
5. Dial in to the telephone number assigned to the SAN Director 2/128, using a telco system to dial in to the modems or the setup described in [“Setting Up a Remote Modem System”](#) on page 158.
6. Observe the modem LEDs: the Ring indicator should flash briefly as the telephone rings. If the Ring indicator does not flash on both units, recheck the incoming telephone lines to the modems.
7. Verify that after one ring the modem associated with the active CP card (usually in slot 5) lights the “Off Hook” (OH) indicator on the modem and a login prompt is presented to the remote client.
8. Log in to the switch from the remote client as admin. The default password is “password”.

---

**Note:** If the Off Hook indicator illuminates on the standby CP card modem, recheck the modem cable connection to the active CP card.

---

9. Log out of the modem session.
10. Remove the telco connector from the active CP card modem, leaving the telco line from the standby CP card connected to the “Y” connector (see [Figure 29](#)).

---

**Note:** The modem session is automatically disconnected if the modem cable is detached while a session is active.

---

11. Dial in to the telephone number assigned to the SAN Director 2/128, as described in “[Setting Up a Remote Modem System](#)” on page 158.
12. Observe the modem lamps: the Ring indicator should flash only on the modem connected to the standby CP card.
13. Verify that after seven rings the Off Hook indicator on the standby CP card modem lights. A login prompt displays on the remote client, and a message confirms you are logged into the standby CP card. You can log in or disconnect the session, as desired.
14. Reconnect the telco connector to the active CP card modem.

The SAN Director 2/128 modems are ready for use.

---

**Note:** Advanced users can use the `hafailover` command to further evaluate the attached modems. The SAN Director 2/128 requires approximately 5 minutes after a failover or reboot to set up the modems.

---



# Technical Specifications



This appendix provides product specifications for the SAN Director 2/128, including:

- [System Architecture](#), page 164
- [System Size and Weight](#), page 165
- [System FRU Weights](#), page 166
- [Facility Requirements](#), page 167
- [Power Specifications](#), page 168
- [Environmental Requirements](#), page 169
- [Power Cords](#), page 170
- [Fibre Channel Port Specifications](#), page 174
- [CP Card Specifications](#), page 175

## System Architecture

[Table 17](#) lists system specifications and summarizes system architecture.

**Table 17: SAN Director 2/128 System Specification**

Specification	Description
Fibre Channel Ports	128 ports, universal (E, F, and FL) Up to eight 16-port cards
Control Processor	Redundant (active/standby) control processor modules
System Architecture	Non-blocking shared-memory
Scalability	Full fabric architecture: 239 switches maximum
Performance	1.063 Gb/s line speed, full duplex; 2.125 Gb/s line speed, full duplex; Autosensing of 1 Gb/s and 2 Gb/s port speeds; optionally programmable to fixed port speed; speed matching between 1 Gb/s and 2 Gb/s ports
ISL Trunking	Up to four 2.125 Gb/s ports per ISL trunk; up to 8.5 Gb/s per ISL trunk
Aggregate Bandwidth	512 Gb/s, end-to-end
Switch Latency	<2.1 $\mu$ sec any port to any port at 2 Gb/s, cut-through routing
Maximum Frame size	2112-byte payload
Frame Buffers	108 per 4-port group, dynamically allocated
Classes of Service	Class 2, Class 3, Class F (interswitch frames)
Port Types	FL_Port, F_Port, and E_Port; self-discovery based on switch type (U_Port); optional port type control
Data Traffic Types	Fabric switches supporting unicast, multicast (255 groups), and broadcast
Media Types	Hot-pluggable, industry-standard SFP, LC connector; short-wave laser (SWL), up to 500 m (1,640 ft.); long-wave laser (LWL), up to 10 km (6.2 mi); extended long-wave laser (ELWL), up to 80 km (49.6 mi); distance depends on fiber optic cable and port speed
Fabric Services	Simple Name Server; Registered State Change Notification (RSN); Alias Server (multicast); Advanced Zoning; Web Tools; Fabric Watch; Extended Fabrics; Remote Switch; ISL Trunking; End-to-End Performance Monitoring

# System Size and Weight

Table 18 lists SAN Director 2/128 dimensions.

Table 18: System Size and Weight

System Size		Weight	
Width	17.22 inches (43.74 cm)	128-port configuration	250 lb (113 kg)
Height	24.11 inches/14U (61.24 cm)	32-port configuration	193 lb (88 kg)
Depth	27.90 inches (70.90 cm)	Empty chassis	104 lb (47 kg)
Depth (with door)	29.20 inches (74.20 cm)		

## System FRU Weights

[Table 19](#) lists the weight of each SAN Director 2/128 FRU.

**Table 19: FRU Weights**

FRU	Weight
Chassis (empty)	104 lb (47 kg)
CP card	7.2 lb (3.3 kg)
16-port card	6.7 lb (3.0 kg)
Filler panel (16-port card)	3.2 lb (1.5 kg)
Power supply	7.0 lb (3.2 kg)
Blower assembly	8.8 lb (4.0 kg)
Chassis door	7.6 lb (3.5 kg)
Cable management tray	0.6 lb (0.3 kg)
WWN bezel	0.6 lb (0.3 kg)



## Facility Requirements

The facility housing the SAN Director 128 must meet the following requirements:

- Power requirements:
  - Input power requirements: 200-240 VAC, 12A, 50-60 Hz
  - Recommended power connector: IEC 320, EN60320 C19-Angled, 16A/250VAC
- Adequate supply circuit, line fusing, and wire size, as specified by the electrical rating on the chassis nameplate
- An air flow of at least 350 cubic feet per minute, available in the immediate vicinity of the SAN Director 2/128
- The power specifications listed in [Table 20](#)
- If the SAN Director 2/128 will be installed in an EIA rack, ensure the following:
  - All equipment installed in the rack has a reliable branch circuit ground connection, and does not rely on a connection to a branch circuit, such as a power strip.
  - The rack is balanced and mechanically secured to provide stability in the event of an earthquake.
  - Additional equipment does not exceed the rack's weight limits.

## Power Specifications

The power subsystem is a redundant +48V DC power distribution system with a provision for up to four 1000-watt, 48V DC bulk power supplies. Bulk power supplies produce the intermediate distribution voltage in the distributed power system.

The power specifications listed in [Table 20](#) are calculated for fully loaded systems with two power supplies. A fully loaded system has eight 16-port cards, two CP cards, and three blower assemblies.



**WARNING:** Make sure to disconnect both power cables to remove all power from the SAN Director 2/128.

**Table 20: Power Specifications**

Specification	Value
Input Voltage	A fully loaded switch requires a maximum of 750 Volt-Amps This results in a main current of 3.2 amps at 240 Vac line voltage or 3.6 amps at 208 Vac line voltage. The rated AC input range is 180 to 264 Vac.
Supported Power Range	Nominal: 200 to 240 Vac, single phase
Input Frequency Range	47-63 Hz
Power Supplies (each)	Output voltages: 48V at 20 amps; 12V at 4 amps Maximum output power: 1000 watts
AC Inrush Current	40A maximum, peak
Ride Through	The supply outputs remain within specified regulation for a minimum of 20 ms after the AC mains are disconnected.
Under Voltage Protection	The SAN Director 2/128 power supply self-protects from any input voltage, static or dynamic, from zero volts to its operating ranges. It recovers to normal operation upon returning to its operating range.

## Environmental Requirements

[Table 21](#) lists the environmental operating ranges. The requirements for non-operating conditions are also provided for acceptable storage and transportation environments.

**Table 21: Environmental Requirements**

Condition	Acceptable Range During Operation	Acceptable Range During Nonoperation
Ambient temperature	0× to 40× Celsius outside switch (50× to 104× Farenheit)	-25× to +70× Celsius outside switch (-13× to 158× Farenheit)
Humidity	20% to 85% RH noncondensing, at 40× Celsius, with maximum gradient of 10% per hour	10% to 85% RH noncondensing, at 70° Celsius
Altitude	Up to 3 km (10,000 ft.) above sea level	0 to 12 km (40,000 ft.) above sea level
Shock	4G, 11MS duration, half-sine wave	20G, 11MS duration, sq. wave
Vibration	5G, 0-3 kHz at 1.0 octave/minute	10G, 0-5 kHz at 1.0 octave/min.
Air flow	350 cu. ft./min. (0.00059 cu. meter/hr)	None required.
Heat dissipation	64 ports: 3690 BTU/hr 128 ports: 6700 BTU/hr	Not applicable.



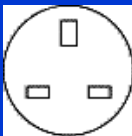


## Power Cords

The types of power cords included with the SAN Director 2/128 are specific to the country where it is installed. For each of these types of power cords, the end that connects to the SAN Director 2/128 chassis has an IEC 60320/C19 cable connector. The two AC power receptacles on each SAN Director 2/128 chassis are equipped with IEC 60320/C20 power connectors.



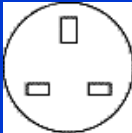


To order a power cord, contact your authorized HP representative.

**Note:** Regulatory compliance might not be complete for some countries listed.



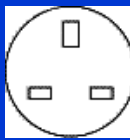


**Table 22: Power Cord Types (International)**

Country	Receptacle Style				
	NEMA L6-20 North America	CEE-7/7 "Schuko" Continental Europe	BS-1363 United Kingdom	AS 3112 Australia/ New Zealand	IEC-60309 6A-6h, 230 V~
					
Argentina					X
Australia				X	
Austria		X			
Bahrain			X		
Belgium		X			
Brazil	X				
Chile	X				
China, People's Rep.					X

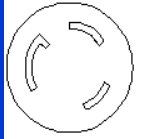

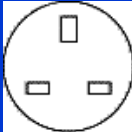


**Table 22: Power Cord Types (International) (Continued)**

Country	Receptacle Style				
	NEMA L6-20 North America	CEE-7/7 "Schuko" Continental Europe	BS-1363 United Kingdom	AS 3112 Australia/ New Zealand	IEC-60309 6A-6h, 230 V~
					
Czech, Rep. of					X
Denmark					X
Egypt					X
England					X
Finland			X		X
France		X			
Germany		X			
Greece		X			
Hong Kong		X			
Hungary			X		
India		X			
Indonesia					X
Ireland, North				X	
Ireland, South		X			
Israel			X		
Italy					X
Japan					X
Korea, South					X

**Table 22: Power Cord Types (International) (Continued)**

Country	Receptacle Style				
	NEMA L6-20 North America	CEE-7/7 "Schuko" Continental Europe	BS-1363 United Kingdom	AS 3112 Australia/ New Zealand	IEC-60309 6A-6h, 230 V~
					
Malaysia		Alternate			Recommended
Mexico	X				
Monaco		X			
Netherlands					X
New Zealand				X	
Norway		X			
Poland					X
Portugal		X			
Puerto Rico	X				
Russia		X			
Saudi Arabia					X
Scotland					X
Singapore			X		
South Africa			X		
Spain					X
Sweden					X
Switzerland		X			
Taiwan	X				

**Table 22: Power Cord Types (International) (Continued)**

Country	Receptacle Style				
	NEMA L6-20 North America	CEE-7/7 "Schuko" Continental Europe	BS-1363 United Kingdom	AS 3112 Australia/ New Zealand	IEC-60309 6A-6h, 230 V~
					
Turkey					X
United Arab Emirate		X			
United Kingdom / Ireland			X		
United States	X		X		
Venezuela	X				
Yugoslavia					X

## Fibre Channel Port Specifications

The fibre channel ports in the SAN Director 2/128 support full duplex link speeds at 2.125 or 1.0625 Gb/s inbound and outbound, automatically negotiating to the highest common speed of all devices connected to the port. Each port has a SerDes (serializer/deserializer) that accepts 10-bit wide parallel data and serializes it into a high-speed serial stream. The parallel data is expected to be “8B/10B” encoded data or equivalent.

The ports are compatible with optical SWL (short wavelength: 780—850 nm) and optical LWL (long wavelength: 1270—1350 nm) SFPs (small form-factor pluggable media) and SFP-compatible cables. The strength of the signal is determined by the type of SFP in use.

The ports are universal and self-configuring, capable of becoming F\_Ports (fabric ports), FL\_Ports (fabric loop enabled), or E\_Ports (expansion ports).



## CP Card Specifications

CP card specifications listed in this section include:

- [Memory Specifications](#)
- [Battery Specifications](#)
- [Terminal Serial Port Specifications](#)
- [Modem Serial Port Specifications](#)

## Memory Specifications

CP card memory specifications include:

- Main memory: 256 MB SDRAM (32 bits wide)
- Flash memory:
  - User flash: 16 MB of 16-bit wide memory, stored in two 8-MB banks
  - Compact flash: 256 MB, partitioned in two 128-MB sections
- Boot flash: 512 KB of 8-bit for system boot

The centralized memory maximizes the overall switch throughput by guaranteeing full transmit at all times.

## Battery Specifications

The CP card has a lithium carbon-monoflouride coin cell battery type Rayovac BR1225, specification 3.0 volt, 50 mAh.



**Caution:** Do not attempt to replace the real time clock (RTC) battery on the CP card. There is danger of explosion if the battery is incorrectly replaced or disposed of. Contact your authorized HP representative if the real time clock malfunctions.

---

## Terminal Serial Port Specifications

Each CP card provides a three-wire terminal serial port (labeled 10101) that provides a “DB-9” male connector and an RS-232 signal subset.

---

**Note:** Keep serial port covered when the port is not in use. The terminal serial port is intended primarily for use during the initial setting of the IP address and for service purposes.

---

The terminal serial port can be used to connect to a computer workstation or terminal without connecting to the fabric. The terminal device should be configured to 9600 baud, 8 data bits, no parity, 1 stop bit, with no flow control.

A 10 ft. (3.0 m) serial cable ships with the switch; it can be converted from a DB-9 serial cable to an RJ-45-style serial cable by removing the adapter on the end of the cable.

The terminal serial port requires a straight-through serial cable with a female 9-pin subminiature-D connector. Use the pinouts listed in [Table 23](#).

**Table 23: Terminal Serial Port Pinouts**

Pin	Signal	Description
1	----	----
2	TxDATA	Transmit Data
3	RxDATA	Receive Data
4	----	----
5	GND	Logic Ground
6	----	----
7	----	----
8	----	----
9	----	----

## Modem Serial Port Specifications

Each CP card has a modem serial port (labeled RS-232) with a fully RS-232 compliant DB-9 connector.

---

**Note:** For dust and electrostatic discharge (ESD) protection, keep the cover on the serial port whenever the port is not in use.

---

The modem port can be used for attaching a modem to each CP card. The SAN Director 2/128 detects modems only during the power-on or reboot sequences, and automatically initializes them for operation. If modems are connected to an operating switch, a power on/off cycle, reboot, or fast reboot is required to detect the modem(s).

If both modems are connected to the telephone line by a “Y” cable, the active CP card answers on the first ring; if the active CP card fails to answer, the standby CP card answers on the seventh ring.

The pinouts for the modem serial port are shown in [Table 24](#).

**Table 24: Modem Serial Port Pinouts**

Pin	Signal	Description
1	DCD	Data Carrier Detect
2	RxDData	Receive Data
3	TxDData	Transmit Data
4	DTR	Data Term Ready
5	GND	Logic Ground
6	DSR	Data Set Ready
7	RTS	Request to Send
8	CTS	Clear to Send
9	RI	Ring Indicator



# Electrostatic Discharge

## B

To prevent damaging the system, be aware of the precautions you need to follow when setting up the system or handling parts. A discharge of static electricity from a finger or other conductor may damage system boards or other static-sensitive devices. This type of damage may reduce the life expectancy of the device.

To prevent electrostatic damage, observe the following precautions:

- Avoid hand contact by transporting and storing products in static-safe containers.
- Keep electrostatic-sensitive parts in their containers until they arrive at static-free workstations.
- Place parts on a grounded surface before removing them from their containers.
- Avoid touching pins, leads, or circuitry.
- Always make sure you are properly grounded when touching a static-sensitive component or assembly.

## Grounding Methods

There are several methods for grounding. Use one or more of the following methods when handling or installing electrostatic-sensitive parts:

- Use a wrist strap connected by a ground cord to a grounded workstation or computer chassis. Wrist straps are flexible straps with a minimum of 1 megohm  $\pm$  10 percent resistance in the ground cords. To provide proper ground, wear the strap snug against the skin.
- Use heel straps, toe straps, or boot straps at standing workstations. Wear the straps on both feet when standing on conductive floors or dissipating floor mats.
- Use conductive field service tools.
- Use a portable field service kit with a folding static-dissipating work mat.

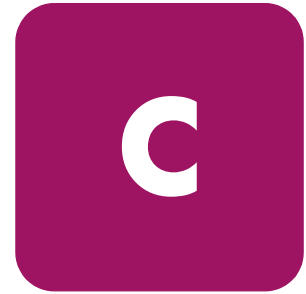
If you do not have any of the suggested equipment for proper grounding, have an HP authorized reseller install the part.

---

**Note:** For more information on static electricity, or for assistance with product installation, contact your HP authorized reseller.

---

# Regulatory Compliance Notices



## FCC EMC Statement (USA)

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at his own expense. The end user of this product should be aware that any changes or modifications made to this equipment without the approval of Hewlett-Packard could result in the product not meeting the Class A limits, in which case the FCC could void the user's authority to operate the equipment.

Regulatory Series Number: HSTNM-N002

## EMC Statement (Canada)

This Class A digital apparatus meets all requirements of the Canadian Interference-Causing Equipment Regulations.

Cet appareil numérique de la Classe A respecte toutes les exigences du Règlement sur le matériel brouilleur du Canada.

## EMC Statement (European Union)

This is a Class A product. In a domestic environment this product may cause radio interference, in which case the user may be required to take adequate measures.

Products bearing the CE marking comply with the EMC Directive (89/336/EEC) and the low voltage directive (73/23/EEC) issued by the Commission of the European Community and if this product has telecommunications functionality, the R&TTE Directive (1999/5/EC).

Compliance with these directives implies conformity to the following European Norms (in parentheses are the equivalent international standards and regulations):

- EN 55022 (CISPR 22)—Electromagnetic Interference
- EN55024 (IEC61000—4-2,3,4,5,6,8, 11)—Electromagnetic Immunity
- EN61000-3-2 (IEC61000-3-2)—Power Line Harmonics
- EN61000-3-3 (IEC61000-3-3)—Power Line Flicker
- EN 60950 (IEC 60950)—Product Safety

## Germany Noise Declaration

Schalldruckpegel  $L_p = 46.1$  dB(A) Am Arbeitsplatz (operator position) Normaler Betrieb (normal operation) Nach ISO 7779:1999 (Typprüfung)

## VCCI EMC Statement (Japan)

この装置は、情報処理装置等電波障害自主規制協議会（VCCI）の基準に基づくクラスA情報技術装置です。この装置を家庭環境で使用すると電波妨害を引き起こすことがあります。この場合には使用者が適切な対策を講ずるよう要求されることがあります。



## RRL EMC Statement (Korea)

### A급 기기 (업무용 정보통신기기)

이 기기는 업무용으로 전자파적합등록을 한 기기이오니  
판매자 또는 사용자는 이 점을 주의하시기 바라며, 만약  
잘못판매 또는 구입하였을 때에는 가정용으로 교환하시기  
바랍니다.

## Laser Safety

### A. Certification and Classification Information

When equipped with native Fibre Channel adapters, this product contains a laser internal to the small form-factor pluggable (SFP) transceiver modules.

In the USA, the SFP module is certified as a Class 1 Laser product, conforming to the requirements contained in Department Of Health and Human Services (DHHS) regulation 21 CFR, Subchapter J. The certification is indicated by a label on the metal SFP housing.

Outside the USA, the SFP is certified as a Class 1 Laser product conforming to requirements contained in IEC 825-1:1993 and EN60825-1:1994, including Amendment 11:1996.

The SFP includes the following certifications:

- UL Recognized Component (USA)
- CSA Certified Component (Canada)
- TUV Certified Component (European Union)
- CB Certificate (Worldwide)

The following figure shows the Class 1 information label that appears on the metal housing of the SFP.

CLASS 1 LASER PRODUCT 21 CFR(J)

### B. Product Information

Each communications port consists of a transmitter and receiver optical subassembly. The transmitter subassembly contains internally a semiconductor laser diode in the wavelength of either 850 nanometers (shortwave laser) or 1310 nanometers (longwave laser).

Class 1 Laser products are not considered hazardous.

### C. Usage Restrictions

Failure to comply with these usage restrictions may result in incorrect operation of the system and points of access may emit laser radiation above the Class 1 limits established by the IEC and U.S. DHHS.



**WARNING:** Use of controls or adjustments or performance of procedures other than those specified herein or in the laser product's installation guide may result in hazardous radiation exposure. To reduce the risk of exposure to hazardous radiation:

- Do not try to open the module enclosure. There are no user-serviceable components inside.
  - Do not open controls, make adjustments, or perform procedures to the laser device other than those specified herein.
  - Allow only HP Authorized service technicians to repair the unit.
-

## Battery Replacement Notice

Your switch is equipped with a lithium manganese dioxide, a vanadium pentoxide, or an alkaline internal battery or battery pack. There is a danger of explosion and risk of personal injury if the battery is incorrectly replaced or mistreated. Replacement is to be done by an HP authorized service provider using the HP spare designated for this product. For more information about battery replacement or proper disposal, contact your HP authorized reseller or your authorized service provider.



**WARNING:** Your switch contains an internal lithium manganese dioxide, a vanadium pentoxide, or an alkaline battery. There is risk of fire and burns if the battery is not handled properly. To reduce the risk of personal injury:

- Do not attempt to recharge the battery.
- Do not expose to temperatures higher than 140°F (60°C).
- Do not disassemble, crush, puncture, short external contacts, or dispose of in fire or water.

---

Batteries, battery packs, and accumulators should not be disposed of with the general household waste. In order to forward them to recycling or proper disposal, please use the public collection system or return them to HP, your authorized HP partners, or their agents.

This glossary defines terms used in this guide or related to this product and is not a comprehensive glossary of computer terms.

## A

### **AL\_PA**

Arbitrated loop physical address. A unique 8-bit value assigned during loop initialization to a port in an arbitrated loop.

### **alias server**

A fabric software facility that supports multicast group management.

### **API**

Application programming interface. A defined protocol that allows applications to interface with a set of services.

### **AW\_TOV**

Arbitration wait time-out value. The minimum time an arbitrating L\_Port waits for a response before beginning loop initialization.

## B

### **backup FCS switch**

Backup fabric configuration server switch. The switch or switches assigned as backup in case the primary FCS switch fails.

### **bandwidth**

The total transmission capacity of a cable, link, or system. Usually measured in bps (bits per second). May also refer to the range of transmission frequencies available to a link or system.

### **broadcast**

The transmission of data from a single source to all devices in the fabric, regardless of zoning.

**buffer-to-buffer flow control**

Management of the frame transmission rate in either a point-to-point topology or in an arbitrated loop.

**C**

**CLI**

Command line interface. Interface that depends entirely on the use of commands, such as through telnet or SNMP, and does not involve a GUI.

**compact flash**

Flash (temporary) memory that is used in a manner similar to hard disk storage. It is connected to a bridging component which connects to the PCI bus of the processor. Not visible within the processor's memory space.

**Configuration**

The way in which a system is set up. May refer to hardware or software.

**Hardware:** The number, type, and arrangement of components that make up a system or network.

**Software:** The set of parameters that guide switch operation. May include general system parameters, IP address information, domain ID, and other information. Modifiable by any login with administrative privileges.

May also refer to a set of zones.

**CRC**

Cyclic redundancy check. A check for transmission errors that is included in every data frame.

**D**

**data word**

A type of transmission word that occurs within frames. The frame header, data field, and CRC all consist of data words.

**defined zone configuration**

The set of all zone objects defined in the fabric. May include multiple zone configurations.

**DLS**

Dynamic load sharing. Dynamic distribution of traffic over available paths. Allows for recomputing of routes when an Fx\_Port or E\_Port changes status.

**domain ID**

Unique identifier for all switches in a fabric, used in routing frames. Usually automatically assigned by the principal switch, but can be assigned manually. The domain ID for an HP switch can be any integer between 1 and 239. Generally, the default domain ID is 1.

**E****E\_D\_TOV**

Error detect time-out value. The minimum amount of time a target waits for a sequence to complete before initiating recovery. Can also be defined as the maximum time allowed for a round-trip transmission before an error condition is declared.

**E\_Port**

Expansion port. A type of switch port that can be connected to an E\_Port on another switch to create an ISL.

**EE\_Credit**

End-to-end credit. The number of receive buffers allocated by a recipient port to an originating port. Used by Class 1 and 2 services to manage the exchange of frames across the fabric between source and destination.

**EIA rack**

A storage rack that meets the standards set by the Electronics Industry Association.

**enabled zone configuration**

The currently enabled configuration of zones. Only one configuration can be enabled at a time.

**end-to-end flow control**

Governs flow of class 1 and 2 frames between N\_Ports.

**error**

As applies to fibre channel, a missing or corrupted frame, time-out, loss of synchronization, or loss of signal (link errors).

**exchange**

The highest level fibre channel mechanism used for communication between N\_Ports. Composed of one or more related sequences, and can work in either one or both directions.

## F

**F\_Port**

Fabric port. A port that is able to transmit under fabric protocol and interface over links. Can be used to connect an N\_Port to a switch.

**fabric**

A fibre channel network containing two or more switches in addition to hosts and devices. May also be referred to as a switched fabric.

**fabric name**

The unique identifier assigned to a fabric and communicated during login and port discovery.

**FCIA**

Fibre Channel Industry Association. An international organization of fibre channel industry professionals. Among other things, provides oversight of ANSI and industry developed standards.

**FCP**

Fibre channel protocol. Mapping of protocols onto the fibre channel standard protocols. For example, SCSI FCP maps SCSI-3 onto fibre channel.

**FCS switch**

Fabric Configuration Server Switch. One or more designated HP switches that store and manage the configuration and security parameters for all switches in the fabric. FCS switches are designated by WWN, and the list of designated switches is communicated fabric-wide.

**fill word**

An IDLE or ARB ordered set that is transmitted during breaks between data frames to keep the fibre channel link active.

**FL\_Port**

Fabric loop port. A port that is able to transmit under fabric protocol and also has arbitrated loop capabilities. Can be used to connect an NL\_Port to a switch.

**FRU**

Field-Replaceable Unit. A component that can be replaced on site.

**FS**

Fibre Channel Service. A service that is defined by fibre channel standards and exists at a well-known address. For example, the Simple Name Server is a fibre channel service.



**FSP**

Fibre channel service protocol. The common protocol for all fabric services, transparent to the fabric type or topology.

**FSPF**

Fabric shortest path first. HP's routing protocol for fibre channel switches.

**Fx\_Port**

A fabric port that can operate as either an F\_Port or FL\_Port.

**G****G\_Port**

Generic port. A port that can operate as either an E\_Port or F\_Port. A port is defined as a G\_Port when it is not yet connected or has not yet assumed a specific function in the fabric.

**H****hard address**

The AL\_PA that an NL\_Port attempts to acquire during loop initialization.

**I****idle**

Continuous transmission of an ordered set over a fibre channel link when no data is being transmitted, to keep the link active and maintain bit, byte, and word synchronization.

**integrated fabric**

The fabric created by connecting multiple HP switches with multiple ISL cables, and configuring the switches to handle traffic as a seamless group.

**ISL trunking**

The distribution of traffic over the combined bandwidth of multiple ISLs. A set of trunked ISLs is called a "trunking group", and the ports in a trunking group are called "trunking ports".

**isolated E\_Port**

An E\_Port that is online but not operational due to overlapping domain IDs or nonidentical parameters (such as E\_D\_TOVs).

## K

### **K28.5**

A special 10-bit character used to indicate the beginning of a transmission word that performs fibre channel control and signaling functions. The first seven bits of the character are the comma pattern.

### **kernel flash**

Flash (temporary) memory connected to the peripheral bus of the processor, and visible within the processor's memory space. Also known as “user flash”.

## L

### **L\_Port**

Loop port. A node port (NL\_Port) or fabric port (FL\_Port) that has arbitrated loop capabilities. An L\_Port can be in one of two modes:

**Fabric mode:** Connected to a port that is not loop capable, and using fabric protocol.

**Loop mode:** In an arbitrated loop and using loop protocol. An L\_Port in loop mode can also be in participating mode or non-participating mode.

### **latency**

The period of time required to transmit a frame, from the time it is sent until it arrives. Together, latency and bandwidth define the speed and capacity of a link or system.

### **link**

As applies to fibre channel, a physical connection between two ports, consisting of both transmit and receive fibres.

### **link services**

A protocol for link-related actions.

### **LIP**

Loop initialization primitive. The signal used to begin initialization in a loop. Indicates either loop failure or resetting of a node.

### **LM\_TOV**

Loop master time-out value. The minimum time that the loop master waits for a loop initialization sequence to return.

**loop failure**

Loss of signal within a loop for any period of time, or loss of synchronization for longer than the time-out value.

**loop initialization**

The logical procedure used by an L\_Port to discover its environment. Can be used to assign AL\_PA addresses, detect loop failure, or reset a node.

**Loop\_ID**

A hex value representing one of the 127 possible AL\_PA values in an arbitrated loop.

**LPSM**

Loop Port State Machine. The logical entity that performs arbitrated loop protocols and defines the behavior of L\_Ports when they require access to an arbitrated loop.

**LWL**

Long wavelength. A type of fiber optic cabling that is based on 1300nm lasers and supports link speeds up to 2 Gbit/sec. May also refer to the type of transceiver.

## M

**master port**

The port that determines the routing paths for all traffic flowing through a trunking group. One of the ports that is in the first ISL in the trunking group is designated as the master port for that group.

**MIB**

Management Information Base. An SNMP structure to help with device management, providing configuration and device information.

**multicast**

The transmission of data from a single source to multiple specified N\_Ports (as opposed to all the ports on the network).

## P

**N\_Port**

Node port. A port on a node that can connect to a fibre channel port or to another N\_Port in a point-to-point connection.

**name server**

Frequently used to indicate Simple Name Server.

**NL\_Port**

Node loop port. A node port that has arbitrated loop capabilities. Used to connect an equipment port to the fabric in a loop configuration through an FL\_Port.

**node**

A fibre channel device that contains an N\_Port or NL\_Port.

**non-participating mode**

A mode in which an L\_Port in a loop is inactive and cannot arbitrate or send frames, but can retransmit any received transmissions. This mode is entered if there are more than 127 devices in a loop and an AL\_PA cannot be acquired.

**Nx\_Port**

A node port that can operate as either an N\_Port or NL\_Port.

## P

**packet**

A set of information transmitted across a network.

**participating mode**

A mode in which an L\_Port in a loop has a valid AL\_PA and can arbitrate, send frames, and retransmit received transmissions.

**path selection**

The selection of a transmission path through the fabric. HP switches use the FSPF protocol.

**phantom address**

An AL\_PA value that is assigned to an device that is not physically in the loop. Also known as phantom AL\_PA.

**phantom device**

A device that is not physically in an arbitrated loop but is logically included through the use of a phantom address.

**PLOGI**

Port login. The port-to-port login process by which initiators establish sessions with targets.

**point-to-point**

A fibre channel topology that employs direct links between each pair of communicating entities.

**port cage**

The metal casing extending out of the fibre channel port on the switch, and into which a GBIC or SFP transceiver can be inserted.

**Port\_Name**

The unique identifier assigned to a fibre channel port. Communicated during login and port discovery.

**POST**

Power On Self-Test. A series of tests run by a switch after it is powered on.

**primary FCS switch**

Primary fabric configuration server switch. The switch that actively manages the configuration and security parameters for all switches in the fabric.

**private loop**

An arbitrated loop that does not include a participating FL\_Port.

**private NL\_Port**

An NL\_Port that communicates only with other private NL\_Ports in the same loop and does not log into the fabric.

**public device**

A device that supports arbitrated loop protocol, can interpret 8-bit addresses, and can log into the fabric.

**public loop**

An arbitrated loop that includes a participating FL\_Port, and may contain both public and private NL\_Ports.

**public NL\_Port**

An NL\_Port that logs into the fabric, can function within either a public or a private loop, and can communicate with either private or public NL\_Ports.

## Q

**quad**

A group of four adjacent ports that share a common pool of frame buffers.

## R

**R\_A\_TOV**

Resource allocation time-out value. The maximum time a frame can be delayed in the fabric and still be delivered.

**RAID**

Redundant Array Of Independent Disks. A collection of disk drives that appear as a single volume to the server and are fault tolerant through mirroring or parity checking.

**request rate**

The rate at which requests arrive at a servicing entity.

**route**

As applies to a fabric, the communication path between two switches. May also apply to the specific path taken by an individual frame, from source to destination.

**routing**

The assignment of frames to specific switch ports, according to frame destination.

**RR\_TOV**

Resource recovery time-out value. The minimum time a target device in a loop waits after a LIP before logging out a SCSI initiator.

**RSCN**

Registered state change notification. A switch function that allows notification of fabric changes to be sent from the switch to specified nodes.

## S

**SAN**

Storage Area Network. A network of systems and storage devices that communicate using fibre channel protocols.

**SDRAM**

The main memory for the switch.

**sequence**

A group of related frames transmitted in the same direction between two N\_Ports.

**service rate**

The rate at which an entity can service requests.

**single mode**

The fiber optic cabling standard that corresponds to distances of up to 10 km between devices.

**SNMP**

Simple Network Management Protocol. An internet management protocol that uses either IP for network-level functions and UDP for transport-level functions, or TCP/IP for both. Can be made available over other protocols, such as UDP/IP, because it does not rely on the underlying communication protocols.

**SNS**

Simple Name Server. A switch service that stores names, addresses, and attributes for up to 15 minutes, and provides them as required to other devices in the fabric. SNS is defined by fibre channel standards and exists at a well-known address. May also be referred to as directory service.

**switch**

Hardware that routes frames according to fibre channel protocol and is controlled by software.

**switch port**

A port on a switch. Switch ports can be E\_Ports, F\_Ports, or FL\_Ports.

**SWL**

Short wavelength. A type of fiber optic cabling that is based on 850nm lasers and supports link speeds up to 2 Gbit/sec. May also refer to the type of transceiver.

## T

**tenancy**

The time from when a port wins arbitration in a loop until the same port returns to the monitoring state. Also referred to as loop tenancy.

**throughput**

The rate of data flow achieved within a cable, link, or system. Usually measured in bps (bits per second).

**topology**

As applies to fibre channel, the configuration of the fibre channel network and the resulting communication paths allowed. There are three possible topologies:

**Point to point:** A direct link between two communication ports.

**Switched fabric:** Multiple N\_Ports linked to a switch by F\_Ports.

**Arbitrated loop:** Multiple NL\_Ports connected in a loop.

**transmission character**

A 10-bit character encoded according to the rules of the 8b/10b algorithm.

**transmission word**

A group of four transmission characters.

**trap (SNMP)**

The message sent by an SNMP agent to inform the SNMP management station of a critical error.

## U

**U\_Port**

Universal port. A switch port that can operate as a G\_Port, E\_Port, F\_Port, or FL\_Port. A port is defined as a U\_Port when it is not connected or has not yet assumed a specific function in the fabric.

## W

**well-known address**

As pertaining to fibre channel, a logical address defined by the fibre channel standards as assigned to a specific function, and stored on the switch.

**workstation**

A computer used to access and manage the fabric. May also be referred to as a management station or host.

**WWN**

World Wide Name. An identifier that is unique worldwide. Each entity in a fabric has a separate WWN.

## Z

**zone**

A set of devices and hosts attached to the same fabric and configured as being in the same zone. Devices and hosts within the same zone have access permission to others in the zone, but are not visible to any outside the zone.

**zone configuration**

A specified set of zones. Enabling a configuration enables all zones in that configuration.



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